1888

Sugar cane: field experiments

William Carter Stubbs

SUGAR CANE.

(FIELD EXPERIMENTS.)

BULLETIN No. 14

OF THE

LOUISIANA SUGAR EXPERIMENT STATION.

WM. C. STUBBS, Ph. D.,

DIRECTOR.

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—ISSUED BY—

THOMPSON J. BIRD,

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SUGAR EXPERIMENT STATION,
KENNER, LA.

Major T. J. Bird, Commissioner of Agriculture, Baton Rouge, La.:

Dear Sir—I hand you herewith for publication Bulletin No. 14—covering experiments in Sugar Cane, made during the past year on this Station.

Respectfully,

WM. C. STUBBS,
Director.

FIELD EXPERIMENTS

In cane during the past year were of four kinds, viz:

1. Germination questions.
2. Physiological questions.
3. Varieties best adapted to Louisiana.
4. Manurial requirements.

These are but the continuation and in many instances the enlargement of the work of the previous year.

GERMINATION QUESTIONS.

The following from Bulletin No. 7, explanatory of our object, is herein inserted:

"It has long been a question among planters whether to plant the tops, the entire stalk, or only the matured part. The practice of planting the green unmatured tops is the one suggested by economy, since these contain little or no sugar, and are frequently thrown away. This practice is, however, severely criticised by some, upon reasons drawn from known principles of vegetable physiology. The cane, say they, has only sterile flowers, and consequently give no seed or grains. Therefore the eyes of the cane are intended to replace the true seed or grain. In all seed-bearing plants, those seed germinate and fruitify best, which are permitted to reach perfect maturity. Therefore in imitation of this natural law, we must seek that part of the stalk which contains the largest and best developed eyes, in order to secure seed which will produce the most vigorous plants. It is further claimed that where tops are universally used as seed that a degeneracy of the cane will follow, since the latter is always reproduced with those parts of the cane where the juices are the poorest in nourishment (sugar) and the eyes the most imperfectly developed. Hence it is a practice with some of our planters never to plant fall cane until the polariscope

shows at least 10 per cent sugar in the cane. *Per contra* there are others who claim that the planting of the tops is justifiable from purely scientific reasons, besides the economy involved. They regard the cane planted as "cuttings" rather than true seed, and the eyes as buds to be developed under proper conditions. They say that the florist when he wants to root new plants, never uses the old or mature wood, but rather the young and succulent portions. Therefore in planting cane the youngest and most succulent portions will secure the best results. Which is right has not yet been decided by science. Experiments in the field have demonstrated that eyes from both the mature and immature parts of the stalk will germinate. But which are the best, i. e., which will insure the best and surest results under the varying conditions of our seasons, soils and rainfall?"

To determine this question, the following experiments were instituted with a view of continuing them through a series of years in order to eliminate as far as possible all the modifying factors, incident to one year's experiment. Great pains were taken to select healthy stalks of uniform length. These were cut up into short pieces beginning with the green immature top. Two eyes were left upon each cutting and each stalk was selected so as to give eleven cuttings. Seventy-five of these cuttings, containing 150 eyes, were devoted to each experiment.

The land was in excellent order, having had a large crop of pea vines turned in early in the fall with a four-horse plow. The cuttings were carefully deposited in each row and covered by hoe. The following are the experiments:

PLAT O.—GERMINATION QUESTIONS.

Experiment No.	1—75	white immature joints of 2 eyes each.
" "	2—75	joints next to No. 1, partially white, 2 eyes each.
" "	3—75	" " " full red, " "
" "	4—75	" " " " " "
" "	5—75	" " " " " "
" "	6—75	" " " " " "
" "	7—75	" " " " " "
" "	8—75	" " " " " "
" "	9—75	" " " " " "
" "	10—75	" " " " " "
" "	11—75	" butts, 2 eyes each.

These experiments were planted February 9th, and occasional observations were made, and the stalks upon each row

carefully counted, until suckering began. At harvest each row was weighed, the stalks counted, the juice separately expressed and carefully analyzed. Table No. 1 contains the number of stalks up at each observation, the number harvested with weights, the average weight of each stalk, the yield and number of stalks per acre. Table No. 2 gives the chemical analyses of the juices, with "purity coefficient," "glucose ratios" and available sugar per ton.

TABLE 1.

PLAT O.—GERMINATION QUESTIONS.

Planting Different Parts of the Stalks of Cane February 9th, 1887.

Part of the Stalk Planted.	Number of stalks from 150 eyes planted counted.									Tons per acre.	No. of Stalks per acre.
	Feb. 27.	Mar 10.	Mar. 13	Mar. 17.	Mar. 19.	Mar. 25.	At Harvest Nov. 3.	Weight of Stalks.	Average Weight of each		
1. Upper white joints	5	24	24	24	26	34	97	247 lbs.	2.54 lbs.	18.14	14.287
2. Next to " "	12	39	41	41	45	45	140	407	2.91	32.06	21.050
3. " No. 2	10	45	48	54	63	69	165	485	2.94	38.18	25.987
4. " No. 3	4	27	34	39	45	51	152	428	2 82	33 7[illegible]	23.940
5. " No. 4	1	27	36	45	51	53	154	442	2.87	31.80	24.255
6. " No. 5	1	25	35	43	52	58	149	426	2.86	33.56	23.467
7. " No. 6	0	19	30	25	33	40	147	400	2.72	31.48	23.152
8. " No. 7	0	13	18	23	27	32	133	320	.41	25.24	20.947
9. " No. 8	1	19	23	28	34	39	130	340	2.61	26.8[illegible]	20.552
10. " No 9	0	12	14	20	26	36	72	214	2.21	16.88	15.276
11. Butts*	0	14	15	20	41	41	73	160	2.19	12.62	11.520

*This row was seriously injured in the summer by proximity to a fig tree.

TABLE 2.

PLAT O.—FIELD AND SUGAR HOUSE RESULTS NOV. 3.

Number and Kind of Experiment.	Yield per acre in tons.	ANALYSES.				Purity Coefficient.	Glucose Ratio.	Lbs. available sugar upon 70 per cent extraction.	
		Degree Baume	Total Solids.	Sucrose.	Glucose.			Per ton	Per acre
1. Upper white joints	18.14	7.4	13.31	10.3	1.24	77.38	12.04	118	2141
2. Next to " "	32.06	7.8	14.01	11.2	1.35	79.94	12.05	128	4104
3. " No. 2	38.18	7.6	13.71	10.3	1.28	75.12	12.42	117	4467
4. " No. 3	33.7[illegible]	7.3	13.21	10.0	1.60	75.70	16.	99	3341
5. " No. 4	34.80	7.8	13.61	10.0	1.60	73.47	16.	99	3445
6. " No. 5	33.56	7.9	14.01	10.9	1.35	77.80	12.38	124	4161
7. " No. 6	31.48	7.3	13.11	10.5	1.28	80.09	12.19	120	3777
8. " No. 7	25.24	7.8	14.01	10.6	1.35	75.63	12 73	120	3029
9. " No. 8	26.82	8.	14.41	10 5	1.35	72.8	12.85	119	3192
10. " No. 9	16.88	7.9	14.31	11.5	1.35	81.36	11.73	133	2245
11. Butts*	12.62	8.4	15.01	12.6	1.21	79.94	10.08	143	1805

*Injured by shade.

One fact was apparent early in the season, viz., that the upper half of the cane germinates much more quickly than the lower half. The dry weather which prevailed during March and April, also demonstrated the incapacity of the young sprouts from the green immature part of the cane, to withstand severe drouths since many on this row perished during these months, while on no other row was there any loss. This fact led us to investigate the dead plants seen occasionally in our fields, and in nearly every instance they were found to be shoots from immature tops. These green immature joints were the parts of the cane usually thrown away in the tops, and contained only partially developed eyes—which early sent forth shoots—many of which perished during the drouth for want of sustenance which the joints did not contain, and which the dry weather prevented the young and very tender roots from absorbing from the earth. Whether these sprouts would have lived had a favorable season prevailed, or had the joints not been detached from the stalk, are questions at present, only of conjecture.

Barring the upper immature tops, our experiments clearly show that the upper portion of the stalk is the equal if not the superior of any other portion for seed, so far as germination, tonnage and available sugar are concerned. Experiment No. 3 —the first full red joint gave the largest number of sprouts, matured canes, tonnage, and available sugar on the plat. The butts in No. 11 give by analyses the largest sugar content; how far this is due to the butts, *per se*, or to the interference of the tree is unknown. The experiments to be described further on also throw light on this interesting subject, and a recurrence to this question will then be made.

HOW MANY STALKS OF CANE TO PLANT?

Any question of equal importance to the one just discussed, was made the basis of a series of experiments during the past year. What number of stalks of cane shall we plant to secure the best results? This question is variously answered in practice; one to four stalks. If we plant in seven-foot rows (the usual width) and use canes five feet long, weighing 2½ pounds each, there will be required to plant an acre, one stalk and a

good lap, about two tons of cane; two and a lap, 4 tons; three and a lap, 6 tons; and four and a lap, 8 tons. Cane was worth in Louisiana during the past season, from $3 to $5 per ton. If, therefore, it can be shown that one stalk and a lap or even two and a lap, furnish an abundance of seed, it is a serious loss of money to plant three or four.

WHICH IS BEST FOR SEED, PLANT OR STUBBLE CANE?

Whether it is best to use plant or stubble cane for seed was combined with the above, so as to make the experiments answer both questions simultaneously. Accordingly a plat of ground one acre deep was laid off for the experiments, and divided perpendicular to its depths into two equal parts, the front was planted with first year stubble, and the rear with plant cane, thus duplicating each one of the questions with both kinds of seed.

In the same plat were also tried a few experiments confirmatory of those already described, viz: What part of the cane is best for seed? Good canes were selected and cut first in two equal parts, the tops planted in one experiment and the butts in the next; and second into three equal parts, the tops given to one experiment, the middles to another, and the butts to a third.

There being ground enough left in this plat for another experiment, the following was tried, duplicated alike with plant and stubble seed: Unslaked lime at the rate of three tons per acre was spread evenly over the top of the row, after the cane was planted and covered, to see if the heat generated by the natural slaking of the lime would not induce early germination and ultimately to test the value of large applications of lime to our soils.

The following are the experiments in full:

No. 1—One cane with a lap, cut in the row.
" 2—Two canes with a lap, cut in the row.
" 3—Three canes with a lap, cut in the row.
" 4—Four canes with a lap, cut in the row.
" 5—One cane, no lap, uncut.
" 6—Upper halves of canes, two and a lap.
" 7—Lower halves of canes, two and a lap.
" 8—Upper thirds of canes, two and a lap.
" 9—Middle thirds of canes, two and a lap.
" 10—Lower thirds of canes, two and a lap.
" 11—Unslaked lime, three tons per acre.

These experiments were planted Feb. 10th, and the young plants carefully counted twice before suckering began. At harvest, each experiment was weighed, stalks counted, juice separately extracted and carefully analyzed. Tables 3 and 4 give the results.

TABLE 3.

PLAT O.—GERMINATION QUESTIONS, GATHERED NOV. 4, 1887.

Number and Kind of Experiment.	March 13		May 25		November 4.					
	No. of Sprouts		No. of Sprouts.		Plant.			Stubble.		
	Plant.	Stubble.	Plant.	Stubble.	No. of Stalks.	Weight of Stalks. lbs	Tons per Acre	No. of Stalks	Weight of Stalks. lbs	Tons per Acre.
1. One cane (cut)	36	50	89	7[illegible]	371	1114	33.42	420	1109	33.27
2. Two " "	87	83	172	154	409	1.3[illegible]	36.96	413	1338	40.14
3. Three " "	13[illegible]	144	220	214	4[illegible]0	1144	34.3[illegible]	440	133[illegible]	40.08
4. Four " "	120	158	250	279	409	1296	38.88	479	1410	42.30
5. One " "	30	48	53	77	357	1146	34.38	413	1132	33.96
6. Upper halves	108	105	14[illegible]	154	421	1360	40.80	436	1292	38.76
7. Lower halves	5[illegible]	57	123	10[illegible]	388	1334	40.0[illegible]	402	980	29.40*
8. Upper thirds	139	101	16[illegible]	147	420	1278	38.34	344	918	27.54*
9. Middle thirds	100	109	165	180	385	1276	38.28	310	860	25.80*
10. Lower thir's	117	4[illegible]	177	104	407	1131	34.02	296	740	22.20*
11. Unslaked lime	114	103	165	155	396	1184	35.52	273	605	18.15*

* Injured more or less by shade of a live oak tree.

TABLE 4.

PLAT O.—GERMINATION—QUESTIONS CONTINUED.

Number and Kind of Experiment.	Yield per acre in tons.	ANALYSES.				Coefficient Purity.	Glucose Ratio.	Pounds available sugar upon 70 per cent extraction.	
		Degree Baume	Total Solids.	Sucrose.	Glucose.			Per ton.	Per acre.
1. 1 cane cut, plant...	33.42	7.05	12.71	9.9	1.77	77.89	17.87	101.5	3392.
1. 1 " " stubble.	33.27	7.3	13.24	11.3	1.57	85.35	13.88	125.30	4169.
2 2 " " plant...	36 96	7.4	13.39	10.2	1.84	76.17	18.03	104.16	3850.
2. 2 " " stubble.	40.14	7.4	13.49	10 2	2.24	7 .61	21.96	95.76	3844.
3 3 " " plant...	34.32	7.3	13.19	10.1	1.92	76.57	19.00	101.08	3469.
3 3 " " stubble.	40.08	7.5	13.69	10.3	1.90	75.23	18.44	104.30	4180.
4. 4 " " plant...	38.78	7.5	13.59	9.9	2.04	73.58	20.60	95.76	3723.
4. 4 " " stubble.	42.30	.5	13.59	10.9	1.90	80.20	17.43	112.70	4767.
5. 1 " unent plant...	34.33	7.3	13.24	10 8	1.90	81.57	17.59	111.30	3821.
5. 1 " " stubble.	33.96	7.4	13.49	10.4	2.00	77.83	19.23	103.60	3418.
6. Up'r halves plant..	40.80	7.3	13.24	10.3	1.90	81.57	17.59	111.30	4541.
6. " " stubble.	38.76	7.5	13.69	10.2	2.00	74.50	19.60	100.80	3907.
7. Lower " plant...	40.02	7.3	13.19	10.8	2.14	81.88	19.51	106.26	4253.
7. " " stubble.	29.40*	7.4	13.49	10.3	2.00	76.64	19.41	102.20	2004.
8. Up'r thirds plant...	38.34	7.3	13.14	10.4	1.90	79.90	18.26	105.70	4053.
8. " " stubble.	27.51*	7.6	13.89	10.6	2.00	77.03	18.86	106.40	2930.
9. Middle " plant...	38.38	7.4	13.44	10.5	1.90	78.12	18.09	107.10	4100.
9. " " stubble.	25.80*	7.6	13.89	10.5	2.00	75.59	19.04	105.00	2709.
10. Lower " plant...	34.02	7.6	12.74	10.0	1.86	78.49	18.60	101.00	3436.
10. " " stubble.	22.30*	7.9	14.29	11.2	1.82	78.37	16.25	118.58	2621.
11. Un'kd lime plant...	35.52	8.1	15.24	12.4	1.40	81.36	11.29	144.20	5122.
11. " " stubble.	18.15*	8.3	15.09	12 9	1.74	85.42	13.48	144.06	2615.

* Injured by proximity of live oak tree.

The cane used in the above experiments was excellent, and the subsequent seasons were all that could be desired. The results secured may not be obtainable every season. However, these experiments strongly point to the conclusion that with good cane in well prepared soil and with good seasons, two canes and a lap furnish an abundance of seed, and the largest profits. This will be more plainly seen by deducting from the tonnage made, the tonnage required to plant as follows:

	PLANT.			STUBBLE.		
	Tonnage made per Acre.	Tonnage Planted.	Net Tonnage per Acre.	Tonnage made per Acre.	Tonnage Planted	Net Tonnage per Acre.
1 stalk	33.42	2.00	31.42	33.27	2.00	31.27
2 stalks...	36.96	4.00	32.96	40.14	4.00	36.14
3 stalks...	34.32	6.00	28.32	40.08	6.00	34.08
4 stalks...	36.88	8.00	32.88	42.30	8.00	32.30

Here two stalks and a lap give the largest net yields, both with plant and stubble, omitting entirely the expense and labor of handling the extra cane necessary in planting four stalks. True economy would therefore point to a concentration of energy in a careful preservation of seed, thorough preparation of soil, and planting not over two stalks and a lap.

It was a source of pleasure while growing to watch the contrast in the rapidity and number of suckers between the thinly and thickly planted experiments. One stalk grew and matured 282 suckers upon plant, and 343 upon stubble, against 159 and 191 respectively, with four stalks. The sugar content was about the same in each.

Another fact is noticeable in these experiments, viz: That the "one stalk uncut" has in both instances proven the equal of "one stalk cut."

These experiments show little or no difference in the yields from plant or stubble cane. In fact, contrary to expectation, where the experiments were not modified by the presence of trees, the stubble seed shows a slight superiority both in tonnage and sugar content.

An inspection of the tables will further confirm the experiments described elsewhere, that the upper part of the cane is as good if not better than any other portion for seed. Elsewhere will be found evidence of their inferiority in sugar to the lower portion of the cane. Theory would then suggest the utilization of the upper thirds of all our cane as seed, and the lower two-thirds for the making of sugar. It is well known that at least one fifth of the entire cane crop is now devoted to seed, an immense loss to the sugar planter. Cannot some feasible plan be adopted whereby the tops only shall be plantad and the remainder so much richer in sugar, be sent to the mill?

The lime in the last experiment has given an increased sugar content and a larger amount of available sugar, without seriously effecting the tonnage. This is a suggestion well worth further investigation.

PHYSIOLOGICAL QUESTIONS.

Influence of Suckers.—A very great diversity of opinion prevails as to influence of suckers "side shoots," which spring up

around the base of the original sprout. This opinion has been based partly upon poorly conducted experiments, and partly upon the erroneous impression which this wrongly used term "sucker" has produced upon the mind. Some think it an abnormal growth, a live parasite preying upon the nutriment of the main stalk and thus depriving the latter temporarily of its vigor, at a time when rapid growth is so desirable, and therefore they should be removed. It has been found on the other hand, however, that these suckers, if permitted to grow, reach maturity almost as soon as the parent salk, is equally as large, and quite as rich in sugar. They also add largely to the crop, and when a thin stand is obtained, the multiplication of suckers rapidly closes the gaps and gives in the end fair yields. Some planters thus ascribe to suckers the greater part of their crop, and encourage their growth by awaiting for their full development in the spring before proceeding to a vigorous cultivation of their crop. They further claim that the suckers give stubble the next year, while the original or central stalks to not ratoon well, if at all.

All these discrepancies of opinion arise from a misunderstanding and misuse of the term "sucker. The habit usually denominated suckering in cane, is not suckering at all, but a process common to all graminaceous plants and known usually as "tillering." It is a natural means of increase and of preserving its own existence in the battle of life. By this means grasses and small grains are enabled to occupy the entire ground to the exclusion of other plants, and thus secure increased harvests. This "tillering" is an underground development characteristic of cane and wheat, and springs from underground buds specially prepared for this process. Simultaneous with the development of the sucker is a set of roots of its own springing directly from it and in no way interfering with the roots of the original plant. The extent of tillering or suckering depends therefore on the healthy growth, the thickness of the stand, and the time it has to sucker in. Abundant tillering is an evidence of thriftiness and an index to increased root development. The cane, however, truly "suckers" but fortunately such occurrences are rare. By true suckers, is meant, the development of eyes

above ground, which produce stalks living at the expense of the parent stalk. This occurs whenever the upward growth of the plant is checked, or the stalk is bent down from any cause, followed by very damp weather, etc. This process is very common to some varieties of sorghum after its main stalk has reached maturity. It is also found in oats which frequently send forth branches from the axis of leaves which bear grain. In both instances the seed unequally ripens. True suckers in cane are therefore very objectionable and should be prevented if possible.

The above from Bulletin No. 7, prefaces the results of attempting to "desucker" cane. The experiments therein given were so conclusive against any attempt to prevent cane from suckering that the following suggestions were offered, which are here repeated:

From the above it is perfectly plain that the "tillering" (suckering) of cane is a natural process of great benefit, and should be restricted with great care. To what extent and when a too great tendency to this process should be corrected is a question for the individual planter to decide. Cane planted too thick, in thin soils, in badly broken, or poorly tilled land, and very late in season, tiller but little. The tendency nevertheless exists, but root growth is checked and with it the prospects of a crop. Hence the aim should be to attain the healthiest and richest type of the plant, and such is to be found only when the conditions exist for its freest and fullest development of all its parts in a manner devised by nature. This suggests then, care in planting, not to secure too heavy a stand in the beginning for the fertility of the soil; proper manuring, in quantity, quality, and mode of application; deep plowing in the preparation of land, and early cultivation of crop, and shallow culture thereafter to prevent disturbance of increased root growth, early planting with well selected seed, and upon mellow well drained soil. A close attention to the above and the process of suckering can be encouraged with hope of highest results.

Whether the stubble comes only from the suckers, can be positively determined next year, since these plats will be reserved for that purpose.

These plats were preserved and watched through the season with considerable interest. The plat upon which no suckers were permitted to grow, presented a few stripped, straggling, scattered, sugarless stalks, long after the regular crop was harvested. These were cut down and thrown on the bagasse pile late in January. Early in February suckering began, and in a few weeks the best stand of cane on the Station was to be seen upon this plat. It seemed as if all the energies of the plant, restrained for an entire year by artificial processes, were suddenly let loose and concentrated upon suckering. So successfully did it accomplish its purpose, that a yield of over 30 tons per acre was obtained, yielding a juice containing 12.4 per cent of sugar.

It is therefore conclusively proven that stubble comes from the original stalks as well as from the suckers.

VARIETIES OF CANE.

In 1886 the Station received and planted what was thought to be 17 varieties of cane. Upon gathering and carefully comparing, these were reduced to five distinct varieties, which were again planted. Mention was made in our last report of the courteous request of Commissioner Colman, at Washington, upon the U. S. Consuls in the various sugar growing countries, to send to this Station, samples of all obtainable varieties of sugar cane. This request has been liberally complied with and since last April this Station has received 55 samples of sugar cane from ten different countries. The following is a complete list of the cane received:

FOREIGN VARIETIES RECEIVED.

Name of Cane.	By Whom Sent.	Where From	Received.	Color.	Condition.
1 Not given	R. O. Williams..	Havana.....	April 4 ..	Green	Good.
2 " "	"	"	"	Yellow	"
3 " "	"	"	"	Red.....	"
1 Cristallina stubble.....	Dr. Alvaro Reynoso	"	April 22..	White	Excellent.
2 Cristallina plant.....	"	"	"	"	"
3 Blanca D'Otaite.....	"	"	"	"	"
Portie	"	"	"	"	"
Loucier.....	"	"	"	"	"
Bambu	"	"	"		
Cavang rie ...	"	"	"	Red	
Plant cane....	W. F. Fuqua....	Livingston Guatamala.	May 23 ..	Green	Dead.
2 Stubble.....	"	"	"	"	"
1 Batavian	U. S. Consul	Antigua	June 18..	striped.....	"
2 Bourbon.....	"	"	"	White	"
3 Caledonian Queen	"	"	"	Green.....	"
4 Batavian Purple Violet....	"	"	"	Purple.....	"
1 Violet.....	"	Jamaica	July 2....	"	"
2 Mont Blanc ..	"	"	"	White	"
3 Ribbon	"			"	"
1 Not given	"	St. Domingo..	July 6...	Green.....	"
1 Native Creole	"	Guadaloupe..	" 13...	"	Fair.
2 Batavian cane	"	"	.....	Striped	"
3 Salanger.....	"	"	.....		
1 White Transparent.....	Moses H. Sawyer	Trinidad.....	.....	White	"
2 Green Rose Ribbon	"	"	.....	Green.....	Poor.
3 Otaheite (plants).....	"	"	.....	Striped	"
4 Bombon.....	"	"	.....	White	"
5 Otaheite Matoons	"	"	.....	Striped	Good.
6 Congo	"	"	.....		"
7 Giant Scarlet.	"	"	.....		
8 Not named ...	"	"	.....	Red.....	
9 " " ...	"	"	.....		
1 " " ...	Unknown.....				
2 " " ...	Steamship Barracouta of N. Y. and forwarded by Lyce & Lynch	Unknown....	July 13...	.....	Dead.
3 " " ...					
4 " " ...					
1 " " ...		Port au			
2 " " ...	E. W. Thompson	Prince	Dec. 1887.	.....	"
3 " " ...	U. S. Consul....	Hayti.....			"
1 Kanio	J. H. Putnam...	Honolulu	Aug. 25..	Light	Excellent.
2 Amaka.....	"	"	"	Dark	"
3 Caledonia	"	"	"	Pale yellow.....	"
4 Ottamaire	"	"	"	Red.....	"
5 Rose Bamboo.	"	"	"	Pinkish.....	"
6 Elephant	"	"	"	Purple striped.....	"
7 Uwala.....	"	"	"	Dove.....	"
8 Ohia.....	"	"	"	Red.....	"
9 Pupuha	"	"	"	Pinkish.....	"
10 Akiolo.....	"	"	"	Green and purple..	"
11 Manulete....	"	"	"	Purple.....	"
12 Honuaula	"	"	"	Dark Red.....	"
13 Papaa.....	"	"	"	.....	"
14 Lahaina.....	"	"	"	Yellow	"
15 Not named ...	"	"	"	.....	"
19 Kokea.....	"	"	"	.....	"

Some of these reached the Station in excellent order; others in execrable condition—in fact, every eye perfectly dead. However, of the 55 varieties shipped, 29 are living and 10 have fur-

nished seed for another year. The Station is under grateful obligations to Hon. T. F. Bayard, Secretary of State, Hon. N. J. Colman, Commissioner of Agriculture, Dr. Alvaro Reynoso, of Cuba, the U. S. Consuls who have forwarded the cane, and the generous planters in the various countries who have furnished it. Out of this large number of varieties received, it is hoped that some may prove beneficial to the sugar industry of the State.

The following letters and extracts may be interesting to our readers:

COPY—TRANSLATION.

EXPERIMENTAL FIELD OF DR. ALVARO REYNOSO.

Ramon O. Williams, Esq., Havana:

My Dear Sir—In the desire to please you, I beg these remarks, informing you that I have complied with your request for the furnishing of the sugar canes, and then amplify them under the belief that you are desirous of the increase of the cultivation of that plant in Louisiana.

1. VARIETY OF CANES CULTIVATED IN THE ISLAND OF CUBA.

The only canes cultivated on a large scale are those of Otahaiti, known as the white and crystalline (blancay cristallina.)

The white cane is planted in virgin soil, and the crystalline in all other lands.

At first, Creole cane (cana criolla), was cultivated in Cuba to make sugar, and its planting was continued afterwards for eating. But for several years past it has not even been preserved for this purpose, and that now sold in the market for eating is the white cane of Otahaiti.

The purple and yellow ribbon canes (cana do cintas morada y amarilla) were formerly much cultivated here, but were afterwards abandoned because it was discovered that in dry and not very fertile lands they yielded little juice and were very woody. Nevertheless, these canes when well cultivated are of excellent qualities. Green ribbon cane of the same variety was also cultivated, but it was abandoned on account of being too delicate.

Many varieties of cane have been introduced in Cuba from Porto Rico, Jamaica, Trinidad and Mauritius, but of these little remain, none of them having been cultivated on a large scale. The elephant cane (cana elefante) was somewhat cultivated but afterwards abandoned because of its brittleness, and not ripening well, being besides too thick to grind it with regularity in the sugar mill. Many persons have uprooted it.

The crystalline cane in its normal state is of a green apple color, but gives many varieties according to soil, exposure, methods of cultivation or atmospheric influences. The most notable variations in this cane are that of acquiring a peculiar yellow color in certain soils which makes it resemble the white cane of Otahaiti; and another variation is that taking a more or

less purple color which makes it resemble other canes of different colors or shades, above all that of the purple ribbon cane (cana de cinta morada). Nevertheless, those canes, notwithstanding their variations recover their genuine original character if planted in proper lands. The number of different varieties of cane supposed to, do not exist; but their variations are numerous.

I send you, marked A., three crystalline canes, the ends of which have been dipped in heated wax. This cane is the result of an experiment which I will further describe in treating of the multiplication of canes through their subterranean shoots, (ratoons).

B. Are three white canes of Otahaiti whose ends are also covered with melted wax.

I would have desired to have been able to send you better samples, but the canes I have are not yet well matured. It will be easy for me further on to furnish you beautiful samples of cane cultivated in cleared forest soil.

So far, your request has been complied with, and I will now make a few remarks:

2. CANE THE MOST FITTER FOR CULTIVATION IN LOUISIANA.

The canes that I consider best for this purpose, owing to their great precocity for ratooning, are those called "Cavengeri," "Portii, "Loucier," "Bambu" and Black Cane from Java" (Negra de Java). I do not send the latter because I know it exists in great quantity in Louisiana and that it is being experimented upon.

A. The "Cavangerie" comes from Mauritius; it grows rapidly, rattoons, and matures extremely well. In order that this cane may be fully appreciated, I will say that I cut 30 canes, leaving numerous ratteons. From these 30 canes I separated 3 useless ones, and the other 27 are put up in a package well prepared, It will be noticed that these canes have grown from one only eye (una sola yema) which was put in the ground on the 1st of October, 1885. I ought to have cut these canes in the month of November or December, of the year 1886, because they were already completely mature, and they have lost in quality and growth by leaving them standing too long. The 27 canes mentioned weigh 186 pounds.

B. Is "Portii" cane from the Mauritius Island; it was highly praised by the manager of the botanical garden when he sent it here. In effect it is an admirable cane. It grows rapidly, ratoons well and its juice weighs more than 12° Baume. One bunch grown from a single root gave me 28 beautiful canes, weighing 233 pounds. I have here to state, as before, that I should have cut these canes in December of last year, but having left them standing they have lost much of their merit on account of having shed their upper sprouts. This bunch of canes was also produced from one single root, Of these, I send you 5 canes weighing 59 pounds.

C. Is the "Loucier" cane from Mauritius, and possesses the same excellent qualities.

This bunch gave me 34 canes, weighing 188 pounds. I should have cut it last year. Of these, I send 5 canes, weighing 41 pounds.

D. Is the "Bambu" cane. It came from Mauritius. In my opinion this cane grows and rattoons faster than any other. Nevertheless, I do not dare to give it preference over the others above mentioned, until after it shall have been experimented upon for the reason that its shoots are much developed, forming many upper sprouts which tend to diminish the yield of sugar, at least for some time.

You have observed the different conditions under which I experiment, and you will readily understand that under better circumstances the results would have been extremely more favorable.

Should it be determined to experiment upon these varieties in Louisiana, I can send you a quantity of them, particularly in January of next year, to plant there.

3. MULTIPLICATION OF CANES THROUGH THEIR SUBTERRANEAN ROOTS.

This matter is treated of in a general manner in the three numbers of the *Journal des Fabricants de Sucre* which accompany herewith. The French translation is not altogether correct, but is sufficiently so to give a fair understanding of the importance of this subject.

All the experiments which I have made confirm, in the most positive manner, the merit of subterranean roots over the eyes of the cuttings taken from the upper part of the cane. In other words, the subterranean stalk as a multiplier is as good as the very best eyes that can be obtained. One single experiment will suffice to prove this. On Thursday, the 25th of February, 1886, I washed a crystalline cane well in water to clean off the earth and then cut the small roots with a pair of scissors. I then separated the roots, dividing them into small pieces having only one root, and planted them.

On Monday, the 22d of March, of the same year, I took up one shoot from the plantings and put it into the best place I could find.

I did not expect to obtain a very favorable result, because the conditions under which I operate are by no means favorable, having been obliged to proceed in an incorrect manner. I was pleased, however, to a certain extent, because its results were better than could have been expected, under such unfavorable conditions.

On Tuesday, the 12th of April, 1887, I cut all the shoots on a level with the ground and obtained:

One more or less developed canes	22
Two sprouts of different sizes	21
Three small sprouts	6
Four canes damaged by accident	5
Total	54

The above mentioned 22 canes weighed 112 pounds.

After cutting off the bunch of canes I pulled up the stock of roots, leaving the earth around them, and placed into the box in which I send it to you to forward it to Louisiana.

As soon as this box arrives at New Orleans, and in order to study and appreciate the foregoing statements it will be necessary to take this stock of roots out of the box and remove all the earth from it with any sharp instrument and put it into water. The roots should be cut off so as to permit an examination of each of the subterranean stalks and the condition of the roots.

This examination will completely prove that it suffices to plant one subterranean stalk to obtain an excellent bunch of canes equal to the best to be obtained by planting the most select upper eyes.

After experiments shall have been made of the foregoing method I would desire that a complete statement of the same be sent me and, if possible, also photographs to add to my collection of observations, in order, thus to complete the history of this trial, which I consider very important, in every respect, and which has only now been made for the first time.

After all this has been done the subterranean roots may be separated the one from the other, and planted.

I will finish, by saying that this experiment has been made under unfavorable auspices for the development of the stalks, and if I had had a better opportunity for operation the result would have been far superior respecting the growth and weight of the cane. However, the fact of having obtained 112 pounds of cane from one root alone, at this season of vegetation, is satisfactory enough.

I would have desired, Mr. Williams, to have been able to serve you better in this matter, but trust, however, that I have manifested my good will to attend to it. Should you desire further details respecting the cultivation of cane and the manufacture of sugar I shall take great pleasure in furnishing them.

I have the honor to be,

Your obedient servant,

DR. ALVARO REYNOSO.

HAVANA, April 14, 1887, Cabzada de Buenos Ayres No. 11.

The above letter was not received until after the stubble mentioned above had been planted in the usual way; too late to be disturbed.

EXTRACT FROM A LETTER FROM U. S. CONSUL MOSES H. SAWYER, TRINIDAD BRITISH WEST INDIES.

"They are numbered and named as follows:

"No. 1—Three canes, Otaheite, plant.
" 2—Three canes, Otaheite, ratoon.
" 3—Three canes, White Transparent, ratoon.
" 4—Three canes, Green Rose Ribbon, plant.
" 5—Three canes, Red Giant Scarlet, plant.
" 6—Three canes, Congo, plant.
" 7—Two canes, Bourbon, plant.

"There are six varieties, and none others are generally planted on th Island. Of all the many kinds that have been tried none others have do well and only two of these are generally planted. Otaheite is the king ca of this island and Bourbon comes next. Indeed they are much alike.

"Planters generally plough up for Otaheite once in ten or twelve year but in good soil this extraordinary cane has ratooned here successfully fo twenty-three years. The transparent, Giant Scarlet and Congo, are hardy, and the Rose Ribbon grows straight up which entice the planter to plant them in some quarters; but the great cane fields of Trinidad are mostly covered with Otaheite and Bourbon. It should be remembered that Trinidad is drenched in profuse rains for two-thirds of the year, making the soil very wet, which is not the case in Louisiana; so that the canes that do so well in Trinidad might not do well in Louisiana, or vice versa."

The following letter to Consul J. H. Putnam, from Mr. W. G. Irwin, of Spreckles Company, who undertook the task of collection describes the varieties sent:

HONOLULU, H. I., August 1, 1887.

Sir—In accordance with your request we have obtained from one of our plantations, thirteen varieties of sugar cane. The canes are carefully packed and will go forward per steamship Australia, to-morrow.

The package labeled No. 12 contains four varieties of cane imported by us, from Queensland, Australia, viz:

Ottamatie, red with faint dark stripes.
Rose Bamboo, pinkish yellow.
Yellow Caledonia, pale yellow.
Elephant, purple with pale green stripes.

These four canes do very well with us, more especially the first mentioned. The canes labeled Pupuha, Manulele, Uwala, Ohia, Akilolo, Honuaula and Papaa are indigenous to these islands. These canes, on lands situated at any altitude between 1,550 and 2,000 feet, are, from the fact of their being exceedingly hardy, the favorite varieties of our planters for such lands. The two packages labeled respectively, Kanio and Ainakea, came originally from Mauritius, where they are as the light and dark Bourbon canes. These two canes yield well on our high lands. Lahaina cane, No. 11, was brought here by Capt. Pardon Edwards, from the Marquesas Islands, and was first planted at Lahaina, whence its name. This cane is preferable to all others on lands near the sea level to an altitude of 1,500 feet. Its introduction into this kingdom has increased the yield of sugar, at least 50 per cent. In consequence of its heavy stooling, this cane should be planted not less than six feet between the hills. Kokea, No. 13, does fairly well on side hills and dry lands, but is not a favorite.

We are sir,

Yours truly,

WM. G. IRWIN & CO.

To J. H. Putnam, U. S. Consul General, Honolulu, H. I.

Besides the above foreign varieties, the Station also received the following:

One hogshead of cane from Mr. Raphel Beltran, New Orleans.

One bundle of cane from Mr. H. Le Sassier, New Orleans.

One bundle of cane from Hon. L. B. Claiborne, Pointe Coupee, La.

One bundle of Creole cane from Mr. R. L. Perkins, Jefferson, La.

The following analyses were made of such samples as attained before frost a size large enough to justify planting. The samples from Cuba were planted in April and attained a very fine size by Nov. 14, at which time they were cut. The Cavangerie particularly, gives promise of a fine yield, and special adaptation to our soil and climate, so far as growth is concerned, but is rather low in sugar. The Crystallina and Loucier which are the highest in sugar, did not reach a large tonnage.

TABLE 5.

PLAT I.—VARIETIES—HARVESTED NOV. 14.

No. of Experiment.	Where From.	Kind.	When Planted	ANALYSIS OCT. 27.			ANALYSIS NOV. 14.				Purity Coefficient.	Glucose Ratio.	Lbs. available sugar per ton upon 70 per cent extraction.
				Degrees Baume.	Total Solids.	Sucrose.	Degrees Baume.	Total Solids.	Sucrose.	Glucose.			
1	Selected, Gen. J. L. Brent	Purple	Nov. 22	8.5	15.39	13.00	8.65	15.60	14.20	1.05	91.05	7.39	190.82
2	Selected, Dr. Wm. E. Brickell	"	" "	8.8	15.89	14.50	8.8	15.90	14.49	.93	90.50	6.11	185.64
3	Mexican, Gen. J. L. Brent	Striped	" "	8.7	15.69	13.30	7.8	14.19	11.00	.94	77.51	9.33	133.84
4	La Pice, Gen. J. L. Brent	White	" "	7.9	14.29	11.30	9.0	16.24	13.50	1.11	83.12	8.22	165.76
5	Bourbon (Cuba), from D. D. Colcock, Sugar Ex	"	" "	8.4	15.09	13.20	9.0	16.24	14.10	1.03	86.82	7.30	175.56
6	Beltran, from Raphael Beltran	Yellowish	March 3	7.4	13.29	10.20	8.4	15.13	13.20	1.28	87.24	9.84	157.92
7	Crystallina, stubble	White	April 22	8.0	14.39	11.40	8.5	15.37	11.60	1.20	75.47	10.34	137.20
8	Crystallina, plant	"	" "	6.9	12.39	7.80	8.2	14.87	11.40	1.67	76.66	14.64	123.90
9	Blanca d'Otahiti	"	" "	7.4	13.29	9.30	8.0	14.47	10.30	1.55	71.17	15.04	101.72
10	Portii	"	" "	6.7	12.09	6.30	7.9	14.37	11.80	1.33	82.11	11.27	137.36
11	Loucier	"	" "	7.2	12.89	8.50	7.3	13.27	8.90	1.64	67.06	18.42	89.16
12	Bambu	"	" "	6.8	12.29	8.90	7.4	13.47	9.80	1.85	73.49	18.87	98.42
13	Cavengerie	Red	" "	6.3	11.39	6.10	6.8	12.27	7.20	1.72	58.67	23.88	64.68
14	U. S. Consul to Cuba	"	" 4	6.2	11.09	5.50							
15	" " "	Green	" 4	6.3	11.34	6.30	6.4	11.64	7.30	1.60	62.71	21.81	68.60
16	" " "	Grn'sh red	" 4	7.7	13.87	9.00							
17	" " "	White	" 4	6.9	12.47	8.40							
18	" " "	Yellow	" 4	6.2	11.17	5.50	6.6	11.94	7.10	1.67	59.44	23.52	64.40
19	Hon L. B. Claiborne	White	March 1	7.8	13.97	9.90	7.9	14.32	12.00	1.08	83.79	9.00	145.32
20	Creole, R. L. Perkins	Green	" 1	6.3	11.29	6.90	6.1	11.08	5.60	1.72	50.44	30.71	42.28
21	Panache, H. LeSassier	White	.....	....	.....	....	8.3	15.09	12.50	1.21	82.83	9.68	149.66
22	Dr. Brickell	Striped	.....	....	.....	....	7.8	14.99	11.50	1.32	81.61	11.40	133.28

MANURIAL REQUIREMENTS.

It is desired to find a fertilizer that will give a maximum tonnage with a maximum sugar content with cane upon the soils of Louisiana. The Station continued last summer its work upon the soils of ower Louisiana. It has already made analyses of 66 samples from 18 parishes. In a few years, after a full investigation, it is designed to classify the soils of the sugar belt, and to designate the fertilizers adapted to each class.

Unfortunately there is no sandy soil on this Station. Beginning at the levee, the soil is a mixture of sandy and black, the latter largely predominating. It shades gradually into stiff black lands as you recede from the river. These analyses of the soil of this Station, taken at different distances from the river, are here appended:

ANALYSES OF SOILS OF SUGAR EXPERIMENT STATION.

	Plat No. 16—Next to River—Mixed Soil.	Plat No. 2—Group 1—200 y'ds from River—Bl'k Soil.	Plat No. 2—Group 7—400 y'ds from River—Bl'k Soil.
Insoluble Matter	79.33	77.52	74.21
Soluble Silica	.01	.01	.01
Potash	.31	.20	.13
Soda	.48	.19	.23
Lime	.46	.57	.52
Magnesia	.04	.03	.03
Peroxide of Iron—Alumina	6.37	6.74	6.63
Phosphoric Acid	.12	.11	.10
Sulphuric Acid	.04	.04	.03
Organic Matter	10.50	14.50	16.24
Carbonic Acid—Chlorine and Loss	2.30	.09	1.87
	100.00	100.00	100.00

An examination of above shows that so far as the mineral ingredients are concerned, that these soils are almost identical. The organic matter increases as we go from the river. These soils are deficient in physical qualities rather than chemical ingredients. The former limiting the available supply of the latter, and requiring the application of manures for large crops. To test the kinds and quantities required, has been the object of the series of experiments which follow. It should be remembered that any physical amendment to a soil, such as underdraining, deep plowing, subsoiling, etc., is in itself a manure, since it enables the roots of a plant to forage over an increased area and thus obtain larger supplies of available food.

The Station had 7 plats devoted to manurial requirements, 3 of which may be designated as strictly scientific, and the rest

as popular. The 3 scientific plats were devoted—1st, to Nitrogenous; 2d, to Phosphoric Acid; 3d, to Potassic Manures.

The object of these plats are:

1. To tell the requirements of these soils for each ingredient
2. To tell the form best adapted to cane.
3. To tell the quantity most profitable for cane.

Accordingly all the available forms of these ingredients have been used in varying quantities. To test the requirements of a soil for any particular ingredient, every other ingredient must be present in excess. Hence each particular ingredient tested has been combined with an excess of other ingredients. The first ground was—

PLAT VI.

NITROGEN MANURES.

First year stubble; off-barred March 5th, with 4-horse plow; hoed April 1st; manures applied and middles broken out; subsequent cultivation with disk cultivator; laid by with 4-horse plow.

The "nothing" experiments were given the centre of the plat, an advantageous position in every instance, especially in black lands, but no better arrangements could be made, and it was preferable to err in favor of no manure, rather than in the fertilizer used.

The object of this plat was: 1st, to test the requirements of this soil for nitrogen; 2d, the form of nitrogen best adapted for cane: 3d, the quantity of nitrogen most desirable.

Accordingly all the available forms of nitrogen have been used, both alone and in combination with phosphoric acid and potash. A full ration of nitrogen has been taken at 72 pounds to the acre, and it has been furnished under each form in such quantities as to give 24, 48 and 72 pounds to the acre, or one-third, two-thirds and three-thirds rations. The plat was four acres deep, the soil increasing in tenacity and stiffness from the front. All of it was black land. It was divided into eight groups of five experiments each, the former running across and the latter with the plat. Each group consisted of: First, an experiment with the normal amounts of phosphoric acid and potash (mixed minerals) without nitrogen; second, of an experiment with no manure; third, fourth and fifth, of mixed minerals, with one-third, two-thirds and three-thirds rations respectively of nitrogen.

In the above "mixed minerals" means always 450 pounds acid phosphate and 120 pounds muriate potash.

Results are appended.

A diagram of the plat with manures used, yield of cane, analyses and available sugar, is also given.

RESULTS OF PLAT NO. 6—NITROGENOUS MANURES—STUBBLE CANE.

No. of Exp't	Manures Used Per Acre.	Yield per Acre in Tons.	ANALYSES.				Purity Coefficient.	Glucose Ratio.	Lbs. available sugar upon 70 per ct. extract.		When Harvested		Remarks.
			Degrees Baume.	Total Solids.	Sucrose	Glucose			Per Ton	Per acre			
1	150 pounds Nitrate of Soda	28.21	7.1°	12.80	9.00	2.30	70.30	25.50	77.7	2192	Oct.	4	Forms of Nitrogen alone.
2	112½ pounds Sulphate of Ammonia	28.14	6.6	11.90	9.00	2.27	75.60	25.20	78.5	2909	"		
3	No Manure	20.44	7.2	13.00	10.10	2.20	77.70	21.70	95.2	1946	"		
4	225 pounds Dried Blood	22.83	7.3	13.20	10.20	2.15	77.30	21.00	97.6	2228	"		
5	360 pounds Cotton Seed Meal	19.81	6.9	12.50	9.00	2.40	72.00	26.60	75.6	1498	"	5	
6	300 pounds Acid Phosphate, 120 pounds Muriate of Potash, Mixed Minerals,	20.16	7.3	13.20	9.90	2.35	75.00	23.70	89.2	1798	"		Nitrate of Soda Group.
7	Mixed Minerals, 150 pounds Nitrate Soda,	27.40	7.4	13.40	10.60	2.00	79.00	19.00	106.4	2913	"		
8	No Manure	18.00	7.3	13.20	9.60	2.50	72.70	26.00	81.0	1474	"		
9	Mixed Minerals, 300 pounds Nitrate Soda,	21.77	6.8	12.30	8.80	2.42	71.50	27.50	72.4	1576	"	6	
10	Mixed Minerals, 450 pounds Nitrate Soda,	26.50	7.4	13.40	10.10	2.15	75.30	21.20	96.2	2550	"		
11	Mixed Minerals	16.72	7.5	13.60	11.40	2.00	83.80	17.50	117.6	1967	"		Sulphate of Ammonia Group.
12	Mixed Minerals, 112½ pounds Sulphate of Ammonia,	21.31	9.6	13.70	11.60	1.85	84.67	15.80	123.5	2633	"		
13	No Manure	15.22	7.2	13.00	10.80	1.80	83.88	16.60	113.4	1726	"		
14	Mixed Minerals, 225 pounds Sulphate of Ammonia,	29.00	7.2	13.00	10.40	2.00	80.00	19.23	103.6	3004	"	7	
15	Mixed Minerals, 337½ pounds Sulphate of Ammonia,	27.16	6.8	12.30	9.60	2.15	78.05	22.39	89.25	2442	"		
16	Mixed Minerals	16.00	7.3	13.20	11.00	1.95	83.33	17.72	113.05	1809	"		Dried Blood Group.
17	Mixed Minerals, 225 pounds Dried Blood,	26.00	7.6	13.70	11.50	1.80	83.21	15.65	123.20	3203	"		
18	No Manure	17.46	7.3	13.20	11.00	1.90	83.33	17.27	114.10	1992	"		
19	Mixed Minerals, 450 pounds Dried Blood,	26.84	6.9	12.50	10.40	1.60	83.20	15.38	112.00	3006	"		
20	Mixed Minerals, 675 pounds Dried Blood,	15.20	6.8	12.30	9.00	2.32	73.17	25.78	75.88	1912	"		

21	Mixed Minerals	13.19	7.8	14.00	11.10	1.80	79.28	16.21	117.60	1552	" 10		
22	Mixed Minerals, 360 pounds Cotton Seed Meal,	19.18	8.15	14.60	12.20	1.45	83.90	11.88	140.30	2695	"		
23	No Manure	15.57	7.9	14.30	12.00	1.66	83.91	13.83	133.20	2074	"		Cotton Seed Meal Group.
24	Mixed Minerals, 720 pounds Cotton Seed Meal,	22.40	7.6	13.70	11.6	1.82	84.67	15.68	124.10	2780	"		
25	Mixed Minerals, 1080 pounds Cotton Seed Meal,	22.36	7.5	13.60	10.90	2.00	80.14	18.35	110.60	2473	"		
26	Mixed Minerals	12.40	8.2	14.80	12.2	1.56	82.43	12.79	138.	1719	" 12		
27	Mixed Minerals, 300 pounds Fish Scrap,	17.70	8.6	15.50	13.1	1.11	84.51	8.47	160.	2816	"		
28	No Manure	12.77	8.2	14.80	12.4	1.60	83.78	12.90	140.	1788	"		Fish Scrap Group.
29	Mixed Minerals, 600 pounds Fish Scrap,	20.33	8.1	14.60	12.7	1.56	87.00	12.28	145.	2948	"		
30	Mixed Minerals, 900 pounds Fish Scrap,	22.70	7.8	14.00	11.5	1.66	82.14	14.43	126.2	2865	"		
31	Mixed Minerals	13.12	8.2	14.80	12.5	1.35	84.46	10.80	146.6	1920	" 13		
32	Mixed Minerals, 50 pounds Nitrate Soda, 40 pounds Sulphate Ammonia, 120 pounds Cotton Seed Meal,	16.69	8.5	15.30	12.9	1.25	84.31	9.69	154.3	2575	"		
33	No Manure	12.71	8.1	14.60	12.3	1.46	84.24	11.88	141.5	1798	"		
34	Mixed Minerals, 100 pounds Nitrate Soda, 80 pounds Sulphate Ammonia, 240 pounds Cotton Seed Meal,	18.60	8.2	14.80	12.3	1.50	83.11	12.20	140.7	2621	"		Mixed Nitrogen Group.
35	Mixed Minerals, 150 pounds Nitrate Soda, 120 pounds Sulphate Ammonia, 360 pounds Cotton Seed Meal,	24.60	8.0	14.50	11.7	1.56	80.69	13.34	131.0	3235	"		
36	200 pounds Fish Scrap	12.60	8.4	15.10	12.3	1.80	81.46	14.63	134.4	1693	"		
37	200 pounds Fish Scrap	18.21	8.4	15.10	12.1	1.66	80.13	13.72	134.5	2450	"		Forms of Nitrogen alone.
38	Nothing	13.33	8.5	15.30	12.6	1.84	82.36	14.60	137.7	1835	"		
39	210 pounds Mixed Nitrogen	14.70	8.5	15.30	12.8	1.50	83.66	11.72	147.7	2171	"		
40	210 pounds Mixed Nitrogen	17.01	8.3	15.00	12.1	1.84	80.67	15.21	130.7	2223	"		

PLAT NO. 6—FORMS OF NITROGEN.

FRONT.

NAMES.	1	2	3	4	5	No. of Experiment.
	Nitrate Soda.	Sulphate of Ammonia.	Nothing.	Dried Blood.	Cot. Seed Meal.	Manures per acre.
Forms of Nitrogen alone.	21.21	28.14	20.44	22.82	19.81	Yield in tons per acre.
	12.80	11.90	13.00	13.20	12.50	Total Solids.
	9.00	9.00	10.10	10.20	9.00	Sucrose.
	2.30	2.27	2.20	2.15	2.40	Glucose.
	2192 lbs.	2209 lbs.	1946 lbs.	2228 lbs.	1498 lbs.	Available sugar per acr
	6	7	8	9	10	No. of Experiment.
	Mixed Minerals	Mixed Minerals Nitrate Soda $\frac{1}{2}$	Nothing.	Mixed Minerals Nitrate Soda $\frac{2}{3}$	Mixed Minerals Nitrate Soda 3-3	Manures per acre.
Nitrate of Soda Group	20.16	27.40	18.00	21.77	26.50	Yield in tons per acre.
	13.20	13.40	13.20	12.30	13.40	Total Solids.
	9.90	10.60	9.60	8.80	10.10	Sucrose.
	2.35	2.00	2.50	2.42	2.15	Glucose.
	1798 lbs.	2913 lbs.	1474 lbs.	1776 lbs.	2350	Available sugar per acr
	11	12	13	14	15	No. of Experiment.
	Mixed Minera's	Mixed Minerals Sul. Ammonia $\frac{1}{2}$	Nothing.	Mixed Mineral's Sul. Ammonia $\frac{2}{3}$	Mixed Minerals Sul. Ammon. 3-3	Manures per acre.
Sulphate of Ammonia Group.	16.72	21.31	15.22	29.00	27.16	Yield in tons.
	13.60	13.70	13.00	13.00	12.30	Total Solids.
	11.40	11.60	10.80	10.40	9.60	Sucrose.
	2.80	1.85	1.80	2.00	2.15	Glucose.
	1967 lbs.	2633 lbs.	1726 lbs.	3004 lbs.	2442 lbs.	Available sugar per acr
	16	17	18	19	20	No. of Experiment.
	Mixed Minerals	Mixed Minerals Dried Blood $\frac{1}{2}$	Nothing.	Mixed Minerals Dried Blood $\frac{2}{3}$	Mixed Minerals Dried Blood 3-3	Manures used per acre.
Dried Blood Group.	16.00	26.00	17 46	26.84	25.20	Yield in tons per acre.
	13.20	13.70	13.20	12.50	12.30	Total Solids.
	11.00	11.50	11.00	10.40	9.00	Sucrose.
	1.95	1.80	1.90	1.60	2.32	Glucose.
	1803 lbs.	3203 lbs.	1992 lbs.	3006 lbs.	1912 lbs.	Available sugar per acr
	21	22	23	24	25	No. of Experiment.
	Mixed Minerals	Mixed Minerals Cotton Meal $\frac{1}{2}$	Nothing.	Mixed Minerals Cotton Meal $\frac{2}{3}$	Mixed Minerals Cotton Meal 3 3	Manures used per acre.
Cotton Meal Group.	13.19	19.18	15.57	22.40	22.36	Yield in tons per acre.
	14 00	14 60	14.30	13.70	13.60	Total Solids.
	11.10	12.20	12.00	11.60	10.90	Sucrose.
	1.80	1.45	1.66	1.82	2.00	Glucose.
	1552 lbs.	2695 lbs.	2074 lbs.	2780 lbs.	2473 lbs.	Available sugar per acre
	26	27	28	29	30	No. of Experiment.
	Mixed Minerals	Mixed Minerals Fish Scrap $\frac{1}{2}$	Nothing.	Mixed Minerals Fish Scrap $\frac{2}{3}$.	Mixed Minerals Fish Scrap 3-3.	Manures per acre.
Fish Scrap Group.	12.40	17.70	12.77	20.33	22.70	Yield in tons.
	14.80	15.50	14.80	14.60	14.00	Total Solids.
	12.20	13.10	12.40	12.70	11.50	Sucrose.
	1.56	1.11	1.60	1.56	1.66	Glucose.
	1719 lbs.	2816 lbs.	1788 lbs.	2948 lbs.	2865 lbs.	Available sugar.
	31	32	33	34	35	No. of Experiment.
	Mixed Minerals	Mixed Minerals M'd Nitrogen $\frac{1}{2}$	Nothing.	Mixed Minerals M'd Nitrogen $\frac{2}{3}$.	Mixed Minerals M'd Nitrog'n 3-3	Manures per acre.
Mixed Nitrogen Group.	13.12	16.69	12.71	18.60	24.60	Tons per acre.
	14.80	15.30	14.60	14.80	14.50	Total Solids.
	12.50	12 90	12.30	12.30	11.70	Sucrose.
	1.35	1.25	1.46	1.50	1.56	Glucose.
	1920 lbs.	2575 lbs.	1798 lbs.	2621 lbs.	3225 lbs.	Available sugar per acre
	36	37	38	39	40	No. of Experiment.
	Fish Scrap $\frac{1}{2}$.	Fish Scrap $\frac{1}{2}$.	Nothing.	Mx'd Nitrogen $\frac{1}{2}$	Mx'd Nitrog'n $\frac{1}{2}$	Manures per acre.
Forms Nitrogen alone.	12.60	18.21	13.33	14.70	17.01	Tons per acre.
	15.10	15.10	15.30	15.30	15.00	Total Solids.
	12.30	12.10	12.60	12.80	12.10	Sucrose
	1.80	1.60	1.84	1.50	1.84	Glucose.
	1663 lbs.	2450 lbs.	1835 lbs.	2171 lbs.	2223 lbs.	Available sugar per acre.

REAR.

Comparison of results will answer the three questions asked.

1st. Does this soil need Nitrogen?

Taking the plat as a whole we find the following averages:

	Yield Per Acre in Tons.	Sucrose.	Glucose.	Pounds available sugar per acre upon 70 per cent extraction.
No Manure	15.62	11.35	1.81	1828
Mixed Minerals	15.27	11.30	1.83	1794
Nitrogen alone	20.17	10.80	1.99	2088
Mixed Minerals with $\frac{1}{3}$ Nitrogen	21.37	12.00	1.57	2806
Mixed Minerals with $\frac{2}{3}$ Nitrogen	23.13	11.30	1.81	2656
Mixed Minerals with 3-3 Nitrogen	24.76	10.40	1.97	2579
Excess of Nitrogen alone over				
No manure	4.55	.....	....	255
Mixed Minerals	4.90	.....	....	289
Excess of Mixed Minerals with $\frac{1}{3}$ Nitrogen over				
No manure	5.75	.....	....	978
Mixed Minerals	6.10	.....	....	1012
Nitrogen alone	1.20	.....	....	723
Excess of Mixed Minerals with $\frac{2}{3}$ Nitrogen over				
No manure	7.51	.....	....	828
Mixed Minerals	7.86	.....	....	862
Nitrogen alone	2.96	.....	....	573
Excess of Mixed Minerals with 3-3 Nitrogen over				
No manure	9.14	.....	....	751
Mixed Minerals	9.49	.....	....	785
Nitrogen alone	4.59	.....	....	496

Both Nitrogen alone and combined with Mixed Minerals have increased the tonnage and available sugar, the largest increase coming from Nitrogen combined with Mixed Minerals.

The second question must be answered by comparing each group with its own "Nothing" and "Mixed Minerals." By taking the mean of the three experiments of Nitrogen in each group and subtracting from it the "Nothing" and then the "Mixed Minerals," and comparing results, we have the following:

	Tons Per Acre.	Pounds available sugar per acre upon 70 per cent extraction.
Excess of Minerals with Nitrate Soda over		
Nothing	7.23	872
Mixed Minerals	5.02	548
Excess of Mixed Minerals with Sulphate of Ammonia over		
Nothing	10.56	967
Mixed Minerals	9.06	726
Excess of Mixed Minerals with Dried Blood over		
Nothing	8.57	715
Mixed Minerals	10.04	898
Excess of Mixed Minerals with Cotton Seed Meal over		
Nothing	5.74	620
Mixed Minerals	8.12	1142
Excess of Mixed Minerals with Fish Scrap over		
Nothing	7.50	1088
Mixed Minerals	7.81	1157
Excess of Mixed Minerals with Mixed Nitrogen over		
Nothing	7.11	1011
Mixed Minerals	6.69	889
Average of above increases over		
Nothing	7.78	879
Mixed Minerals	7.79	893

It is evident from above that no form of nitrogen on this soil has any great advantage over another either in increased tonnage or available sugar. It is also evident that phosphatic manures without nitrogen are of no avail, and that to produce the best effects both phosphates and nitrogen must be present.

Third—The quantity of nitrogen most desirable per acre has been incidentally answered under our first question, treating the plat as a whole.

We then found that the tonnage was larger with heavier doses of nitrogen, but the available sugar per acre was less. Recapitulating we have the average as follows:

	Tons Per Acre.	Pounds available sugar per acre upon 70 per cent extraction.
Average of 1-3 rations	21.37	2773
Average of 2-3 rations	23.14	2656*
Average of 3-3 rations	24.76	2579

Each group taken separately will show but slightly different results. The one-third ration shows largest sugar yield in the nitrate soda and dried blood groups; the two thirds ration in sulphate ammonia, cotton seed meal and fish scrap; the three-thirds ration in mixed nitrogen. The last, however, shows but a slightly increased quantity over the one-third ration.

Seasons have much to do with results, and only by the elimination of their influence through a series of years can positive deductions be made from field experiments. However, this plat with a good stand and fair season, suggests strongly the following conclusions:

1. That our soil needs nitrogen badly, and that the best effects are produced when it is mixed with phosphoric acid.

2. That no particular form of nitrogen has a decided advantage over others—a conclusion most gratifying, since it permits us to use our own cotton seed meal, instead of some of the more costly imported forms of nitrogen.

3. That excessive quantities of nitrogen are not productive of the best results—24 to 48 pounds equivalent to 400 to 700 pounds of cotton seed meal per acre are the limits, suggested by these experiments of maximum sugar production—when properly combined with mineral manures.

*Leaving out the nitrate of soda which was unaccountably low we have as average of the rest 2872.

PHOSPHORIC ACID MANURES—PLAT 7—STUBBLE CANE.

The object of this plat is to test the form and quantity of phosphoric acid best adapted to cane; using it in a soluble form in dissolved boneblack and acid phosphate, in a precipitated form as precipitated boneblack and precipitated acid phosphate, and in insoluble form as bone dust and finely ground Charleston phosphate, called "floats;" also in the natural form of Orchilla guano. Each used in 1-3, 2-3 and 3-3 rations. Off-barred with 4-horse plow March 3d; dug, manures applied, and middles split out March 31st; subsequent workings with disk cultivator; laid by with 4-horse plow.

There is appended a table with list of manures and results; also a diagram of the plat with explanation. Basal mixture in this plat means 540 pounds cotton seed meal, 540 pounds kainite.

TABLE 7.

PLAT NO. 7—PHOSPHORIC ACID MANURES.

No. of Exp't	Manures Used Per Acre.	Yield Per Acre in Tons.	ANALYSES. Degrees Baume.	Total Solids.	Sucrose.	Glucose.	Purity Coefficient.	Glucose Ratio.	Lbs. available sugar upon 70 per ct. extract. Per ton	Per acre	When Harvested.	Remarks.
1	Basal Mixture	27.05	7.9	14.2	10.5	1.60	74.00	15.24	113.4	3067	Oct 14	
2	Basal Mixture, 180 pounds Dissolved Boneblack,	27.96	7.6	13.7	10.	1.95	73.00	19.50	99.05	2768	"	
3	Nothing	18.02	7.7	13.9	10.	2.00	72.00	20.00	98.	1766	"	Dissolved Boneblack Group.
4	Basal Mixture, 360 pounds Dissolved Boneblack,	28.42	7.6	13.7	10.5	1.85	76.64	17.62	108.11	3069	"	
5	Basal Mixture, 540 pounds Dissolved Boneblack,	31.95	7.9	14.2	11.	1.65	77.46	15.00	119.3	3812	"	
6	Basal Mixture	22.89	8.4	15.2	12.5	1.50	82.24	12.00	143.5	3285	Oct 15	
7	Basal Mixture, 180 pounds Acid Phosphate,	28.84	7.5	13.6	11.	2.00	80.88	18.18	112.	3230	"	
8	Nothing	19.49	7.8	14.1	11.1	2.04	79.43	18.20	114.	2220	"	
9	Basal Mixture, 360 pounds Acid Phosphate,	24.99	7.6	13.7	10.5	1.61	76.64	15.33	113.2	2823	Oct 17	Acid Phosphate Group.
10	Basal Mixture, 540 pounds Acid Phosphate,	30.90	7.7	13.9	10.8	1.72	77.69	15.92	116.	3584	"	
11	Basal Mixture	25.35	8.3	14.9	12.6	1.23	84.56	9.76	150.	3802	"	
12	Basal Mixture, 180 pounds Precipitated Boneblack,	26.36	8.1	14.6	12.4	1.36	84.93	10.96	144.	3794	"	
13	Nothing	19.07	7.9	14.2	11.3	1.66	79.57	14.70	124.	2365	Oct 18	Precipitat'd Boneblack Group.
14	Basal Mixture, 360 pounds Precipitated Boneblack.	24.99	7.9	14.2	12.	1.56	84.50	13.00	135.2	3379	"	
15	Basal Mixture, 540 pounds Precipitated Boneblack,	24.81	8.0	14.4	11.9	1.43	82.64	12.01	136.5	3386	"	
16	Basal Mixture	23.31	8.2	14.8	12.4	1.47	83.79	11.85	142.7	3326	"	
17	Basal Mixture, 180 pounds Precipitated Boneblack,	23.94	8.0	14.5	11.9	1.37	82.06	11.51	138.	3303	Oct 19	
18	Nothing	18.65	8.0	14.5	10.5	1.69	72.41	16.10	111.5	2076	"	Precipitat'd Acid Phosphate Group.
19	Basal Mixture, 360 pounds Precipitated Acid Phosphate,	23.62	8.2	14.89	11.2	1.46	75.22	13.04	126.	2976	"	
20	Basal Mixture, 540 pounds Precipitated Acid Phosphate,	27.23	8.2	14.89	12.5	1.52	83.95	12.15	143.	3893	"	
21	Basal Mixture	25.27	8.2	14.8	12.5	1.04	84.46	8.32	153.	3870	Oct 20	
22	Basal Mixture, 180 pounds Bone Dust,	25.02	8.2	14.8	12.3	1.08	83.11	8.78	149.	3740	"	
23	Nothing	15.36	8.	14.4	12.3	1.27	85.42	10.32	146.	2242	"	Bone Dust Group.
24	Basal Mixture, 360 pounds Bone Dust,	23.27	8.	14.4	12.3	1.42	85.42	11.54	142.	3313	"	
25	Basal Mixture, 540 pounds Bone Dust,	26.68	8.3	14.9	12.2	1.08	81.88	8.85	148.	3849	"	
26	Basal Mixture	19.21	8.6	15.5	13.7	1.01	88.38	7.37	170.	3278	"	
27	Basal Mixture, 180 pounds Floats,	19.63	8.5	15.4	14.0	1.02	90.91	7.28	175.	3335	"	
28	Nothing	12.39	8.6	15.5	14.1	1.05	90.96	7.45	175.	2173	Oct 21	R'k Phosphate or Floats Gr.
29	Basal Mixture, 360 pounds Floats,	22.05	8.5	15.3	12.7	1.35	83.00	10.62	150.	3307	"	
30	Basal Mixture, 540 pounds Floats,	26.24	8.5	15.3	13.1	1.17	85.62	8.93	159.	4171	"	
31	Basal Mixture	14.84	8.7	15.7	12.5	1.00	79.61	8.00	154.	2285	"	
32	Basal Mixture, 180 pounds Orchilla,	22.19	8.8	15.8	13.2	1.18	83.56	8.93	160.	3550	"	
33	Nothing	12.28	8.4	15.1	12.9	1.10	85.43	8.52	158.	1940	"	
34	Basal Mixture, 360 pounds Orchilla,	17.22	8.9	16.0	13.4	1.00	83.12	7.46	167.	2876	"	Natural Phosphate Group.
35	Basal Mixture, 540 pounds Orchilla,	20.79	8.8	15.8	13.8	.80	87.34	5.80	176.	3659	"	
36	Basal Mixture	15.96	9.	16.2	12.7	.80	78.40	6.30	161.	2570	Oct 22	
37	Basal Mixture, 180 pounds Gypsum,	16.59	8.7	15.4	12.5	.83	81.17	6.64	158.	2621	"	
38	Nothing	11.34	7.2	12.9	10.6	.88	82.17	8.30	130.	1474	"	
39	Basal Mixture, 300 pounds Gypsum,	15.33	8.5	15.3	12.1	.91	79.08	7.52	150.	2300	"	Gypsum Group.
40	Basal Mixture, 540 pounds Gypsum,	12.07	8.2	14.8	11.6	.84	78.37	7.24	131.	1581	"	

PLAT VII.—Phosphoric Acid Manures.

Ground October 14th.

No. of Experiment	1	2	3	4	5	
Yield per acre, tons	27.05	27.96	18.02	28.42	31.95	
Total Solids	14.20	13.70	13.90	13.70	14.20	Dissolved Boneblack Group.
Sucrose	10.50	10.00	10.00	10.50	11.00	
Glucose	1.60	1.95	2.00	1.85	1.65	
Lbs. av. sugar per acre	3067	2768	1766	3069	3812	
No. of Experiment	**6**	**7**	**8**	**9**	**10**	
Yield per acre, tons	22.89	28.88	19.49	24.99	30.90	
Total Solids	15.20	13.60	14.10	13.70	13.90	Acid Phosphate Group.
Sucrose	12.50	11.00	11.20	10.50	10.80	
Glucose	1.50	2.00	2.04	1.61	1.72	
Lbs. av. sugar per acre	3285	3230	2220	2823	3584	
No. of Experiment	**11**	**12**	**13**	**14**	**15**	
Yield per acre, tons	25.36	26.36	19.07	24.99	24.81	
Total Solids	14.90	14.60	14.20	14.20	14.40	Precipitated Dissolved Boneblack Group.
Sucrose	12.60	12.40	11.30	12.00	11.90	
Glucose	1.23	1.36	1.66	1.55	1.43	
Lbs. av. sugar per acre	3802	3794	2365	3379	3386	
No. of Experiment	**16**	**17**	**18**	**19**	**20**	
Yield per acre, tons	23.31	23.94	18.65	23.62	27.23	
Total Solids	14.80	14.50	14.50	14.89	14.89	Precipitated Acid Phosphate Group.
Sucrose	12.40	11.90	10.50	11.20	12.50	
Glucose	1.47	1.37	1.69	1.46	1.52	
Lbs. av. sugar per acre	3326	3303	2076	2976	3893	
No. of Experiment	**21**	**22**	**23**	**24**	**25**	
Yield per acre, tons	25.27	25.02	15.36	23.27	26.68	
Total Solids	14.80	14.80	14.40	14.40	14.90	Bone Dust Group.
Sucrose	12.50	12.30	12.30	12.30	12.20	
Glucose	1.04	1.08	1.27	1.42	1.08	
Lbs. av. sugar per acre	3870	3740	2242	3313	3849	
No. of Experiment	**26**	**27**	**28**	**29**	**30**	
Yield per acre, tons	19.21	19.63	12.37	22.05	26.24	
Total Solids	15.50	15.40	15.50	15.30	15.30	Rock Phosphate or Floats Group.
Sucrose	13.70	14.00	14.10	12.70	13.10	
Glucose	1.01	1.02	1.05	1.35	1.17	
Lbs. av. sugar per acre	3270	3335	2173	3307	4171	
No. of Experiment	**31**	**32**	**33**	**34**	**35**	
Yield per acre, tons	14.84	22.19	12.28	17.22	20.79	
Total Solids	15.70	15.80	15.10	16.00	15.80	Orchilla Group.
Sucrose	12.50	13.20	12.90	13.40	13.80	
Glucose	1.00	1.18	1.10	1.00	.80	
Lbs. av. sugar per acre	2285	3550	1940	2876	3659	
No. of Experiment	**36**	**37**	**38**	**39**	**40**	
Yield per acre, tons	15.96	16.59	11.34	15.33	12.07	
Total Solids	16.20	15.40	12.90	15.30	14.80	Gypsum Group.
Sucrose	12.70	12.50	10.60	12 10	11.60	
Glucose	.80	.83	.88	.51	.84	
Lbs. av. sugar per acre	25.70	2621	1474	2300	1581	

Basal Mixture	Basal Mixture and ½ Ration.	Nothing.	Basal Mixture and ⅔ Ration.	Basal Mixture and 3/3 Ration.

By comparing in each group the "basal mixture" with the "basal mixture mixed with the phosphate" we obtain the benefit derived from the phosphoric acid, and by comparing them with the unfertilized experiments, we obtain the increase due to the manure. It must be noted, however, that the "nothings" occupied the center of the plat and from their location were naturally better than the rest of the plat. This natural advantage was recognized before planting, but no better arrangement could be devised.

By inspecting the diagram it will be found that the basal mixture occupied the extreme left of the plat, adjoining the tiled drained plat." In fact the tiles ran within a few feet of the row and some of the results of this basal mixture must be assigned to tiles. We thus account for the unusually small differences which occur here but not elsewhere on the Station, between the use of basal mixture and basal mixture and phosphates.

Taking each group up separately we have for Group 1 Dissolved Boneblack.

GROUP 1.

	Tons.	Lbs. available sugar.
Yield of nothing per acre	18.02	1766
Yield of Basal Mixture	27.05	3067
Yield of 1-3 ration Dissolved Boneblack	27.96	2768
Yield of 2-3 ration Dissolved Boneblack	28.42	3069
Yield of 2-3 ration Dissolved Boneblack	31.95	3812
Increase due to 1-3 ration over Basal Mixture	.91	....
Increase due to 2-3 ration over Basal Mixture	1.37	2
Increase due to 3-3 ration over Basal Mixture	4.90	745
Increase Basal Mixture over nothing	9.03	1301
Increase 1-3 ration over nothing	9.94	1002
Increase 2-3 ration over nothing	10.40	1303
Increase 3-3 ration over nothing	13.93	2046

Comparing each group in this way we have:

GROUP 2.

	Tons.	Lbs. available sugar.
Increase Basal Mixture over nothing	3.40	1065
Increase 1-3 ration Acid Phosphate over nothing	9.35	1010
Increase 2 3 ration Acid Phosphate over nothing	5.50	603
Increase 3-3 ration Acid Phosphate over nothing	11.40	1364

GROUP 3.

	Tons.	Lbs. available sugar.
Increase Basal Mixture over nothing	6.28	1437
Increase 1-3 ration Prec. Dissolved Bone over nothing	7.29	1429
Increase 2-3 ration Prec. Dissolved Bone over nothing	5.92	1014
Increase 3-3 ration Dissolved Bone over nothing	5.74	1021

GROUP 4.

	Tons.	Lbs. available sugar.
Increase Basal Mixture over nothing	4.66	1250
Increase 1-3 ration Prec. Acid Phosphate over nothing	5.29	1227
Increase 2-3 ration Prec. Acid Phosphate over nothing	4.97	900
Increase 3-3 ration Prec. Acid Phosphate over nothing	8.58	1817

GROUP 5.

	Tons.	Lbs. available sugar.
Increase of Basal Mixture over nothing	9.91	1628
Increase of 1-3 ration Bone Dust over nothing	9.36	1498
Increase of 2-3 ration Bone Dust over nothing	7.91	1071
Increase of 3-3 ration Bone Dust over nothing	11.32	1607

GROUP 6.

	Tons.	Lbs. available sugar.
Increase of Basal Mixture over nothing	6.82	1105
Increase of 1-3 ration Floats over nothing	7.24	1262
Increase of 2-3 ration Floats over nothing	9.66	1194
Increase of 3-3 ration Floats over nothing	13.85	1938

GROUP 7.

	Tons.	Lbs. available sugar
Increase of Basal Mixture over nothing	2.56	345
Increase of 1-3 ration Orchilla over nothing	9.91	1610
Increase of 2-3 ration Orchilla over nothing	4.94	936
Increase of 3-3 ration Orchilla over nothing	8.51	1719

GROUP 8.

	Tons.	Lbs. available sugar.
Increase of Basal Mixture over nothing	4.62	1096
Increase of 1-3 ration Gypsum over nothing	5.25	1147
Increase of 2-3 ration Gypsum over nothing	3.99	826
Increase of 2-3 ration Gypsum over nothing	.73	107

It is evident from above that phosphates have increased the tonnage, but the sugar content is not increased proportionately as was to be expected. The tiled draining assisted doubtless the maturity of the basal mixture. This plat was ground October 14th, most too early for large sugar contents. Large quantities of phosphates have again not proven remunerative. Of the forms of phosphoric acid used the soluble in dissolved boneblack and acid phosphate, and the insoluble in floats and orchilla have given best results. That in bone dust has given no increase over basal mixture alone. Gypsum too seems to be without effect.

PLAT VIII—POTASSIC MANURES.

STUBBLE CANE—HARVESTED NOVEMBER 1-3.

This plat was designed to test primarily the requirements of this soil for potash, and then to determine the form and quantity best adapted to cane. There has been used the muriate, sulphate, nitrate, carbonate and kainite, and such quantities of each have been taken as to represent 60, 120 and 180 pounds of pure potash per acre, or 1-3, 2-3 and 3-3 rations. These are excessive quantities, but they are used with the hope of determining whether potash in any form or quantity affected the tonnage or sugar content of cane. This plat was off-barred with 4-horse plow March 2d, hoed March 28th and 29th, and fertilizers applied March 31st, 1887, and middles split out. Subsequent treatment with disk cultivator. Laid by with 4-horse plow.

TABLE 8.

RESULTS OF PLAT NO. 8—POTASSIC MANURES.

No. of Experiment.	Manures Used Per Acre.	Yield per acre in tons.	ANALYSES.				Purity Coefficient.	Glucose Ratio.	Lbs. available sugar upon 70 per cent. extraction.		When Harvested.	Remarks.
			Degrees Baume.	Total Solids.	Sucrose.	Glucose.			Per ton.	Per acre.		
6	Meal Phosphate	26.39	8.8°	15.97	13.4	1.25	83.90	9.32	161.4	4259	Oct 31	Muriate Potash Group.
7	Meal Phosphate 120 pounds Muriate Potash	28.28	8.6	15.57	13.3	1.25	85.42	9.37	160.0	4525	"	
8	Nothing	21.26	8.4	15.17	13.	1.40	85.69	10.71	152.6	3044	"	
9	Meal Phosphate 240 pounds Muriate Potash	30.55	8.4	15.17	13.	1.22	85.69	9.38	156.4	4778	"	
10	Meal Phosphate 360 pounds Muriate Potash	*	8.9	16.07	13.5	1.17	84.00	8.67	164.5	....	"	
11	Meal Phosphate	.....	8.4	15.27	12.6	1.28	82.51	10.16	149.5	....	Nov. 1	Kainite Group.
12	Meal Phosphate 480 pounds Kainite	25.62	8.5	15.37	13.1	1.22	85.23	9.31	157.8	4043	"	
13	Nothing	19.78	8.2	14.87	11.7	1.47	78.68	12.56	133.0	2631	"	
14	Meal Phosphate 960 pounds Kainite	27.65	8.4	15.27	12.4	1.20	81.20	9.67	148.4	4103	"	
15	Meal Phosphate 1440 pounds Kainite	*	8.6	15.67	12.9	1.00	82.32	7.75	159.6	....	"	
16	Meal Phosphate	21.21	9.0	16.37	14.8	.90	90.41	6.08	188.3	3994	Nov. 2	Sulphate of Potash Group.
17	Meal Phosphate 120 pounds Sulphate Potash	25.45	8.8	15.91	14.	1.28	88.00	9.15	169.1	4304	"	
18	Nothing	13.34	8.6	15.61	13.8	1.22	88.40	8.84	167.6	2236	"	
19	Meal Phosphate 240 pounds Sulphate Potash	27.09	8.5	15.41	13.5	1.37	87.60	10.14	106.3	4586	"	

TABLE 8—*Continued.*

No. of Experiment.	Manures Used Per Acre.	Yield per acre in tons.	ANALYSES.				Purity Coefficient.	Glucose Ratio.	Lbs. available sugar upon 70 per ct. extraction		When Harvested.	Remarks.
			Degrees Baume.	Total Solids.	Sucrose.	Glucose.			Per ton.	Per acre.		
20	Meal Phosphate 360 pounds Sulphate Potash	*	8.5	15.41	13.5	1.37	87.60	10.14	169.3	....	"	
21	Meal Phosphate	19.00	8.8	15.81	13.5	1.07	85.39	7.92	166.6	3165	"	
22	Meal Phosphate 82½ pounds Carbonate Potash	23.90	9.1	16.41	14.7	.95	89.58	6.46	185.9	4443	"	Carbonate of Potash Group.
23	Nothing	16.24	8.6	15.61	13.3	1.37	85.29	10.30	157.5	2558	"	
24	Meal Phosphate 165 pounds Carbonate Potash	25.10	8.8	15.91	13.9	1.17	87.36	8.41	156.1	3918	"	
25	Meal Phosphate 247½ pounds Carbonate Potash	*	8.7	15.71	13.7	1.28	87.20	9.34	164.9	....	"	
26	Meal Phosphate	19.00	9.0	16.31	14.1	1.22	86.45	8.65	171.8	3364	"	
27	Meal Phosphate 135 pounds Nitrate Potash	22.85	8.8	15.81	13.5	1.28	85.39	9.41	162.1	3704	"	Nitrate of Potash Group.
28	Nothing	16.41	8.5	15.31	12.7	1.28	82.95	10.08	150.9	2476	"	
29	Meal Phosphate 270 pounds Nitrate Potash	27.51	8.6	15.57	12.	1.35	77.07	11.25	139.7	3843	"	
30	Meal Phosphate 405 pounds Nitrate Potash	*	8.5	15.31	12.5	1.05	81.64	8.40	153.0	....	"	

*These experiments occupied the extreme Northern portion of the farm and were depredated upon largely by freedmen from adjoining plantation, hence the tonnage per acre was seriously vitiated and is not given.

PLAT VIII—POTASSIC MANURES.

	Meal Phosphate.	Meal Phosphate & ⅓ Ration.	No Manure	Meal Phosphate & ⅓ Ration.	Meal Phosphate & 3-3 Ration.	
No. of Experiment.....	6	7	8	9	10	
Yield per acre in tons....	26.39	28.28	21.26	30.55	*	
Total Solids	15.97	15.57	15.17	15.17	16.07	
Sucrose.....	13.40	13.30	13.00	13.00	13 50	Muriate Potash Group.
Glucose	1.25	1.25	1.40	1.22	1.17	
Lbs. available sugar 70 per						
Percent extraction per acre	4259	45.25	3044	4778	....	
No. of Experiment	11	12	13	14	15	
Yield per acre in tons ...	.....	35.62	19.78	27.65	*	
Total Solids	15.27	15.37	14.87	15.27	15.67	
Sucrose.....	12.60	13.10	11.70	12.40	12.90	Kainite Group.
Glucose.....	1.28	1.22	1.47	1.20	1.00	
Lbs. available sugar 70 per						
Percent extraction per acre	.....	4043	1631	4103	.....	
No. of Experiment.....	16	17	18	19	20	
Yield per acre in tons ...	21.21	25.45	13.34	27.09	*	
Total Solids	16.37	15.91	15.61	15.41	15.41	
Sucrose.....	14.80	14.00	13.80	13.50	13.50	Sulphate Potash Group
Glucose.....	.90	1.28	1.22	1.37	1.37	
Lbs. available sugar 70 per						
Percent extraction per acre	3994	4304	2236	4586	.....	
No. of Experiment.....	21	22	23	24	25	
Yield per acre in tons....	19.00	23.90	16.24	25.10	*	
Total Solids	15.81	16.41	15.61	15.91	15.71	
Sucrose.....	13.50	14.70	13.30	13.90	13.70	Carbonate Potash Group.
Glucose.....	1.07	.95	1.37	1.17	1.28	
Lbs. available sugar 70 per						
Percent extraction per acre	3165	4443	1558	3918	.....	
No. of Experiment	26	27	28	29	30	
Yield per acre in tons....	19.00	22.85	16.41	27.51	*	
Total Solids	16.31	15.81	15.31	15.57	15.31	
Sucrose.....	14.10	13.50	12.70	12.00	12.50	Nitrate Potash Group.
Glucose.....	1.22	1.28	1.28	1.35	1.05	
Lbs. available sugar 70 per						
Percent extraction per acre	3364	3704	2476	3843	.....	

By combining as we did under Plat 7, we have:

GROUP 1.

	Tons.	Lbs. available sugar.
Increase of Meal Phosphate over nothing	5.13	1215
Increase of 1-3 ration of Muriate over nothing	7.02	1481
Increase of 2-3 ration of Muriate over nothing	9.29	1734

GROUP 2.

	Tons.	Lbs. available sugar.
Increase of Meal Phosphate over nothing	....	....
Increase of 1 3 ration of Kainite over nothing	5.84	1412
Increase of 2-3 ration of Kainite over nothing	7.87	1472

GROUP 3.

	Tons.	Lbs. available sugar.
Increase of Meal Phosphate over nothing	7.87	1758
Increase of 1-3 ration Sulphate over nothing	12.11	2068
Increase of 2.3 ration Sulphate over nothing	13.75	2350

GROUP 4.

	Tons.	Lbs. available sugar.
Increase of Meal Phosphate over nothing	2.76	607
Increase of 1-3 ration Carbonate over nothing	7.66	1885
Increase of 2-3 ration Carbonate over nothing	8.86	1362

GROUP 5.

	Tons.	Lbs. available sugar.
Increase of Meal Phosphate over nothing	2.59	886
Increase of 1-3 ration Nitrate over nothing	6.44	1228
Increase of 2-3 ration Nitrate over nothing	11.10	1367

From the above it will be seen that every form of potash has increased the tonnage more or less over meal phosphate without enhancing the sugar content. This will readily be seen by inspecting the columns of "yield per acre" and "available sugar per ton." It will be seen too that increased quantities have given increased yields. This is decidedly perplexing, for our experiments elsewhere this year and last year showed no increase due to potash. The results are also contrary to those obtained at the Barbadoes Agricultural Experiment Station for 1886. In the summary of conclusions arrived at on the action of the manures, in the report of this Station for 1886 we find:

6. "The addition of potash to manurings of superphosphate and nitrogen may not increase the yield of total produce to any very marked extent but from its tendency to increase the development of the cane causes a large increase in the amount of available sugar in the juice.

7. The presence of potash in the manures in rather high relative proportions apparently tends to increase the amount of sucrose in the canes. This point is worthy of further investigations.

8. The presence of an excess of potash in the manures does not injuriously affect the purity of the juice by increasing the glucose or appreciably the amount of potash salts contained in it.

An inspection of our results will show that potash has increased the tonnage to a marked extent; in one instance No. 29 as much as 8½ tons over No. 26 meal and phosphate, and the lowest No. 7, 1.89 tons over No. 6 meal and phosphate, but there is no large increase in available sugar per ton, where potash was used. Again increased quantities of potash have not given increase amounts of sucrose in the canes.

This Station concurs in the first part of the 8th conclusion, viz., that excess of potash has not increased the glucose in the juice, but dissents for the present from the last part. Our laboratory experiments in the analyses of ash from juices from this plat for this year are not yet complete. They will be ready for our Bulletin on the "Sugar House," which will appear later. But our experiments of last year indicated that excessive quantities of potash in manures are probably detrimental to the yield of sugar. See Bulletin No. 10, pages 71 and 72.

Our conclusion from this plat is that potash has simply increased the tonnage of cane without affecting the sucrose or glucose. Whether this increase is due to the potash "per se" or to its indirect action as a solvent of plant food already in the soil is yet an unsolved problem. It is known to all agriculturists that certain manures stimulate only, i. e., act as a re-agent to disintegrate and bring in solution the plant food already contained in the soil. Under this head come gypsum, lime, salt, etc. These excessive doses of potash were applied to these identical plats in 1886 and 1887. They were without appreciable effect in 1886. It may be that these good effects in 1887 are to be ascribed entirely to their solvent influences upon this stiff black land, acting through nearly two years, bringing in solution large quantities of nitrogen from the organic matter present, which has given an increased growth to the cane. This subject will receive full investigation in the future. For the present, it suffices to know that potassic manures used in large quantities upon these black lands, did produce an increased tonnage.

PLAT XV—PLANT CANE.

In the spring of 1886 this plat was sown broadcast in cow peas. A luxuriant growth of vines was obtained. In September the plat was divided into two equal parts. The pea vines on the west side were removed, cured into hay, and fed to the stock. The entire plat was then turned over with a 4-horse plow. There was thus presented a basis for an experiment with and without pea vines, to test the value of first, the roots alone, and second, the roots and vines. A portion of this plat was planted with plant and the rest with stubble cane. It was also divided into 5 groups of 4 experiments each.

First and second groups next to the river were fertilized at the time of planting, the fourth and fifth groups furthest from the river, in the spring, and the third or middle group was not fertilized at all. Each group had thus two experiments with pea vines turned under, and two with vines removed. The manures were duplicated on both. In Group 1, cotton seed meal, acid phosphate and kainite were used as manure. In experiment 1, the meal and phosphates were combined in proportion of 2 to 1. In experiment 2, in equal quantities. The kainite was constant in both.

Group 2 was manured like Group 1, except the kainite was tted.

Group 2 was unmanured.

In Group 4, experiment 1, the nitrogen was supplied in form itrate soda, sulphate ammonia and cotton seed meal. Of the ole amount of nitrogen supplied $\frac{3}{5}$ was in form of nitrate soda, sulphate of ammonia, and 2-8 in cotton seed meal. This combined with acid phosphate and kainite.

Experiment 2 of same group, had all its nitrogen in form of ate of soda, which was also combined with acid phosphate.

In Group 5, experiment 1, dried blood and sulphate of ammonia supplied the nitrogen, while sulphate of ammonia alone s used in experiment 2. Both had also acid phosphate and nite. The following are manures used:

PLAT XV—PLANT CANE.

Experiment 1—
- 300 pounds Cotton Seed Meal,
- 150 pounds Cotton Seed Meal,
- 100 pounds Kainite, } Applied Oct. 18th.
- 200 pounds Cotton Seed Meal,
- 100 pounds Acid Phosphate, } Applied June 3d.

Experiment 2—
- 300 pounds Cotton Seed Meal,
- 300 pounds Acid Phosphate, } Applied Oct. 18th.
- 100 pounds Kainite,
- 200 pounds Acid Phosphate,
- 200 pounds Cotton Seed Meal, } Applied June 3d.

Experiment 3—Like 1, without Kainite.

Experiment 4—Like 2, without Kainite.

Experiment 5—No manure.

Experiment 6—No manure.

Experiment 7—
- 100 pounds Nitrate Soda,
- 70 pounds Sulphate Ammonia,
- 300 pounds Cotton Seed Meal, } Applied March 18th.
- 300 pounds Acid Phosphate,
- 100 pounds Kainite,
- 100 pounds Nitrate Soda,
- 70 pounds Sulphate Ammonia, } Applied June 3d.

Experiment 8—
- 300 pounds Nitrate Soda,
- 300 pounds Acid Phosphate,
- 100 pounds Kainite, } March 18th.
- 300 pounds Nitrate Soda, Applied June 3d.

Experiment 9—
- 100 pounds Sulphate Ammonia,
- 200 pounds Dried Blood,
- 300 pounds Acid Phosphate, } March 18th.
- 100 pounds Kainite,
- 100 pounds Sulphate Ammonia, Applied June 3d.

Experiment 10—
- 200 pounds Sulphate Ammonia,
- 300 pounds Acid Phosphate, } Applied March 18th.
- 100 pounds Kainite,
- 200 pounds Sulphate Ammonia, Applied June 3d.

The following is the table of results and diagram of plat:

PLAT XV.—PLANT CANE.

No. of Experiment.	Manures Used Per Acre.	Disposition of Pea Vines.	Yield per acre in tons.	ANALYSES.				Coefficient of Purity.	Glucose Ratio.	Lbs. available sugar upon 70 per ct. extraction.		When Ground.	Remarks.
				Degrees Baume.	Total Solids.	Sucrose.	Glucose.			Per ton.	Per acre.		
1	500 pounds Cotton Seed Meal, 250 pounds Acid Phosphate, 100 pounds Kainite,	Turned in.	38.60	7.8	14.13	11.30	1.57	80.	13.89	125	4825	Nov. 18	
1	Ditto	Removed.	38.88	7.4	13.43	10.00	1.57	74.46	15.	107	4160	"	
2	500 pounds Cotton Seed Meal, 500 pounds Acid Phosphate, 100 pounds Kainite,	Turned in.	40.60	7.4	13.43	10.00	1.40	74.43	14.	111	4507	"	
2	Ditto	Removed.	41.38	8.	14.50	11.20	1.30	77.24	11.60	132	5462	"	
3	500 pounds Cotton Seed Meal. 250 pounds Acid Phosphate,	Turned in.	39.07	7.9	14.20	11.20	1.40	78.77	12.50	127	4962	"	
3	Ditto	Removed.	35.14	8.	14.43	10.80	2.36	74.84	21.85	102	3584	Nov. 17	Inj'd by sh'd
4	500 pounds Cotton Seed Meal, 500 pounds Acid Phosphate,	Turned in.	40.91	7.5	13.63	10.50	1.40	77.02	13.33	116	4774	"	
4	Ditto	Removed.	33.30	8.4	15.23	11.30	2.33	74.19	20.61	109	3630	"	Inj'd by sh'd
5	No Manure	Turned in.	33.92	7.9	14.37	10.70	2.00	74.46	18.69	108	3663	" 15	
5	No Manure	Removed.	33.59	7.7	13.91	10.20	1.93	73.33	18.92	102	3426	"	
6	No Manure	Turned in.	36.36	7.8	14.17	10.60	1.96	74.80	18.49	107	3890	"	
6	No Manure	Removed.	33.45	8.4	15.07	11.20	1.93	74.32	17.23	116	3880	"	
7	200 pounds Nitrate Soda, 140 pounds Sulphate Ammonia, 300 pounds Cotton Seed Meal, 300 pounds Acid Phosphate, 100 pounds Kainite,	Turned in.	37.97	7.1	12.77	8.00	2.36	62.64	29.50	62	2354	"	
	[illegible]	Removed.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
8	600 pounds Nitrate Soda, 300 pounds Acid Phosphate, 100 pounds Kainite,	Turned in.	39.45	7.2	12.87	9.60	2.08	74.59	21.66	85	3353	"	
8	Ditto	Removed.	37.36	7.3	13.17	9.20	2.30	69.85	26.08	81	3110	"	
9	200 pounds Sulphate Ammonia, 200 pounds Dried Blood, 300 pounds Acid Phosphate, 100 pounds Kainite,	Turned in.	39.45	7.4	13.33	10.60	1.84	79.52	17.35	110	4653	Nov. 9	
9	Ditto	Removed.	38.34	6.6	11.93	8.00	2.00	67.05	25.	70	2904	"	
10	400 pounds Sulphate Ammonia, 300 pounds Acid Phosphate, 100 pounds Kainite,	Turned in.	42.30	7.1	12.83	9.00	1.95	70.14	21.64	85	3726	"	
10	Ditto	Removed.	41.48	6.9	12.43	9.10	1.84	73.21	20.22	89	3355	"	

PLAT XV—PLANT CANE.

	Pea vines turned under		Pea vines removed.			
No. of Experiment.....	1	2	1	2	Full Fertilized. Plant Cane.	
Yield per acre in tons ...	38.60	40.60	38.88	41.38		GROUP 1.
Total Solids	14.13	13.43	13.43	14.50		
Sucrose.....	11.30	10.00	10.00	11.20		
Glucose.....	1.57	1.40	1.57	1.30		
Lbs. av. sugar per acre .	4825	4507	4160	5462		
No of Experiment.....	3	4	3*	4*		
Yield per acre in tons....	39.07	40.91	35.14	33.30		GROUP 2.
Total Solids	14.20	13.63	14.43	15.23		Without Potash
Sucrose.....	11.20	10.50	10.80	11.30		
Glucose.....	1.40	1.40	2.36	2.33		
Lbs. av. sugar per acre.	4962	4746	3584	3630		
No. of Experiment	5	6	5	6		
Yield per acre in tons....	33.92	36.36	33.59	33.45		GROUP 3.
Total Solids	14.37	14.17	13.91	15.07		
Sucrose.....	10.70	10.60	10.20	11.20		No Manure.
Glucose.....	2.00	1.96	1.93	1.93		
Lbs. av. sugar per acre.	3663	3890	3426	3880		
No. of Experiment	7	8	7	8	Spring Fertilized. Stubble Cane.	
Yield per acre in tons....	37.97	39.45	37.36	38.39		GROUP 4.
Total Solids	12.77	12.87	12.87	13.17		
Sucrose.....	8.00	9.60	9.20	9.20		
Glucose.....	2.36	2.08	2.18	2.30		
Lbs. av. sugar per acre.	2354	3353	3101	3110		
No. of Experiment.....	9	10	9	10		
Yield per acre in tons ...	42.30	43.83	41.48	37.70		GROUP 5.
Total Solids	13.33	12.83	11.93	12.43		
Sucrose.....	10.60	9.00	8.00	9.10		
Glucose.....	1.84	1.95	2.00	1.84		
Lbs. av. sugar per acre.	4653	3726	2904	3355		

*Injured by proximity of large pecan tree.

It may be interesting to know the exact contents of each ingredient per acre in each experiment. A table is here given. Upon Nos. 7, 8, 9 and 10, excessive quantities of nitrogen were used to demonstrate the fact that large tonnage low in sugar always results:

	Lbs. of nitrogen per acre.	Lbs. of phosphoric acid per acre.	Lbs. of potash per acre.	Average tons per acre.	Average available sugar per acre.
Experiment No. 1	35.00	52.50	22.00	38.74	4493
" " 2	35.00	90.00	22.00	40.99	4985
" " 3	35.00	52.50	10.00	39.07	4962
" " 4	35.00	90.00	10.00	40.91	4746
" " 7	81.00	54.00	18.00	37.66	2728
" " 8	84.00	45.00	12.00	38.92	3231
" " 9	66.00	45.00	12.00	41.89	3778
" " 10	84.00	45.00	12.00	40.76	4004

One fact is here clearly demonstrated by the last four experiments, viz., that excessive quantities of nitrogenous manures induce large tonnage poor in sugar. Here we have 37 to 44 tons of cane to the acre with the available sugar running as low as 2354 pounds per acre. It has been shown under nitrogenous manures that a ration containing from 24 to 48 pounds of nitrogen was abundant for best results. These experiments confirm those in a most positive manner. Has kainite benefitted this cane either in tonnage or sugar content? Comparing Group 1 with 2, we find no superiority in weight or sucrose, The portion of this plat planted with plant had no advantage over that planted with stubble except the former earlier came to a stand.

The main question asked of this plat is what benefit is to be derived from turning under the pea vines. To answer this question a comparison of results must be made.

	Tons.	Lbs. available sugar.
Sum of experiments with vines turned under	393.01	40.482
Sum of experiments with vines removed	370.67	36.612
Difference due to vines	22.34	3.870
Average increase per acre due to vines	2.23	387

Omitting experiments 3 and 4, which were modified by the presence of a large pecan tree many feet away, we have average

increase per acre due to vines 1.08 tons and 138 pounds available sugar; quantities quite small in view of the large amount of vines turned under.

Perhaps in view of the large amount of fertilizers applied to a portion of this plat, it would be best to compare only those experiments upon which no manure was applied. Doing this we have an increase per acre due to vines turned under of 1.62 tons of cane, and 123 pounds of available sugar.

ANALYSES OF PEA VINES AND ROOTS.

The great difference of opinion among farmers and planters as to the value of pea vines as a green manure caused the Station to institute the above experiments, together with those that are about to be described. All admit the great value to the succeeding crop of cane, of a crop of peas, grown either alone or with corn, but it is strongly contended by some that the vines can be removed for feed without injury to the subsequent crops, that the roots alone, after the vines are permitted to shade the ground through the summer, are valuable as plant food. Others assert that the turning in of green vines in the fall is an absolute injury, and if turned in at all, it should be done only in the spring after they have served as a mulch through the winter. Such differences of opinion arise largely from the character and condition of the soil, seasons and subsequent cultivation. To test the absolute value in plant food of a crop of vines and roots, the following experiments were instituted here during the past summer.

In a piece of land upon which the cow pea, Clay variety, sown broadcast was growing, a small plat 10 by 10 square, was selected, and the vines carefully cut with a scythe in the usual way. These vines were weighed at once, taken to the laboratory, thoroughly dried and analyzed. Around this plat a ditch 18 inches deep was dug, and with a strong force spray pump the roots were carefully washed up, weighed, dried and analyzed. The vines were reaching maturity, had passed the time when they should have been cut for hay, had very few pods on them, and as the analyses shows contained much woody fibre. The tap roots contrary to expectation, were quite short, rarely going

below 8 inches. The lateral roots were very numerous, penetrating the soil in every direction, growing a network of roots and rootlets wonderful to behold, and proving conclusively that no amount of labor could *artificially* incorporate vegetable matter so completely and perfectly with the soil. Some of these laterals were also quite large, approximating in size, the tap roots at a few inches below the soil. To this mechanical separation and disintegration of the soil, must be ascribed some of the good effects of peas upon the alluvial lands of south Louisiana, to say nothing of the aid to drainage which these vegetable fibres soon converted into ducts or small tiles, engender. Leaving out of consideration at present, the mechanical effects produced in our stiff lands by a crop of peas, let us ask the question what amount of chemical food do they possess, both vines and roots.

The following are the results of the work done September 12th, 13th and 14th, calculated to the acre:

Amount of green vines removed per acre	21.345 lbs.
Amount of roots washed up per acre	3.464 "
Amount of vines after being thoroughly dried	3.330 "
Amount of roots after being thoroughly dried	1.040 "
Total dry matter per acre	4.370 "

It is proper to add here that despite our persistent and careful efforts for three days, the time devoted to washing up these roots, that a considerable quantity of the smaller hair roots escaped us. However, the aggregate weight of these must have been very small.

ANALYSES OF DRIED VINES.

*Organic matter	90.26
Ash	9.74
*Containing nitrogen	1.70 per cent.

ASH CONTAINED.

Phosphoric acid	4.92 per cent.
Potash	28.51 " "
Lime	10.31 " "

ANALYSES OF DRIED ROOTS.

*Organic matter	92.58 per cent.
Ash	7.42 " "
*Containing nitrogen	.80 " "

ASH CONTAINED.

Phosphoric acid	5.73 per cent.
Potash	23.42 " "
Lime	13.14 " "

Applying these analyses we have on one acre of cow pea roots:

Organic matter	964.68 lbs.
Mineral matter	77.32 "

CONTAINING:

Nitrogen	8.34 lbs.
Phosphoric acid	4.43 "
Potash	18.10 "
Lime	10.16 "

ONE ACRE OF COW PEA VINES.

Organic matter	3005.70 lbs.
Mineral matter	324.30 "

CONTAINING:

Nitrogen	56.61 lbs.
Phosphoric acid	15.96 "
Potash	92.46 "
Lime	32.44 "

One acre therefore of pea roots contains of plant food amounts about equal to 120 pounds cotton seed meal and 130 pounds kainite.

One acre of pea vines contains amounts about equal to 800 pounds cotton seed meal, and 640 pounds kainite, so far as nitrogen and potash are concerned, and over supply of phosphoric acid by about 8 pounds.

When both are returned to the land there is an amount of plant food equal to 920 pounds cotton seed meal, 770 pounds kainite.

We thus see that the vines are by far the richer in plant food. Why then do we not readily see the difference in increased yields when the vines are turned under and when they are removed? Many reasons exist. Frequently vines are turned in a continuous layer just below the surface, where they remain for some time undecomposed, greatly to the injury of the soil and crop. Sometimes these vines produce a sourness in the soil, especially when there is a deficiency of lime. In open porous soils vines turned in green in the fall or summer rapidly decompose, and the products of fermentation are leached beyond the reach of the roots of crops by spring. Again vines turned in dry in the fall, often remain undecomposed through the next season; especially in stiff clay soil, and there-

fore show no apparent benefit the first year. Such is probably the case in our stiff alluvial lands of South Louisiana.

Whatever the opinions of practical men may be, the fact remains that when a heavy crop of vines are turned under, a large amount of plant food is returned to the soil, which sooner or later must be utilized. It is therefore good economy to turn in the vines whenever we can spare them from our stock. The benefits of the root residues are far more apparent, because so ultimately incorporated with the soil they soon decompose and furnish valuable plant food, at same time by their decomposition

There is found an innumerable number of little air and water ducts through the soil, and in these the carbonic acid generated by decay will act upon a maximum amount of soil, and through these passages an excess of water will escape, followed by air, which will aid in preparing the soil for the future crop.

Since pea vine hay is so universally used as stock food in Louisiana, it may not be amiss to give the analyses of it when cut very green and fully ripe.

ANALYSES OF PEA VINE HAY.

	When cut ripe.	When cut green.
Albuminoids	10.63	17.01
Cellulose	32.60	24.68
Fat	3.20	2.90
Carbohydrates	43.83	45.98
Ash	9.74	9.43

The above shows that for hay the pea vines should be cut green, i. e., just as they begin to form green pods.

Before leaving this subject it may be of interest to state that there was washed up with the roots of the pea vines, coco roots, equal to 3158 pounds (dried) per acre. They have not yet been analyzed.

PLAT II—STUBBLE CANE.

Offbarred February 3d, and hoed and middles split out March 1st, manures applied March 29th and 30th. Subsequent treatment with disk harrow. Laid by with 4 horse plow.

The object of these experiments is to test the efficacy of certain popular manures, together with the quantities most desirable for most productive results. Accordingly varied quantities of cotton seed meal and acid phosphate, cotton seed meal and floats. Tankage alone in various quantities and combined with other substances, cotton seed alone and in combination, etc.

Results are appended.

TABLE 10.

RESULTS OF PLAT NO. 2—FIRST YEAR STUBBLE.

No. of Exp't	Manures Used Per Acre.	Yield per Acre in Tons.	ANALYSES. Degrees Baume.	Total Solids.	Sucrose.	Glucose	Purity Coefficient.	Glucose Ratio.	Pounds available sugar upon 70 per cent extraction. Per ton	Per acre	When Harvested	Remarks.
1	200 pounds Cotton Seed Meal 100 pounds Acid Phosphate	23.28	8.9	16.10	14.90	.80	92.54	5.37	191.80	4465.10	Nov. 21	
2	333 pounds Cotton Meal 167 pounds Acid Phosphate	28.22	8.3	14.97	12.30	1.21	82.16	9.83	146.79	4142.51	Nov. 22	
3	140 pounds Sulphate Ammonia 120 pounds Dried Blood 200 pounds Cotton Meal 460 pounds Acid Phosphate 80 pounds Muriate Potash	33.38	8.2	14.83	11.40	1.18	76.87	10.35	134.82	4500.29	Nov. 23	
4	466 pounds Cotton Meal 234 pounds Acid Phosphate	30.20	8.1	14.63	12.40	1.30	84.75	10.48	146.30	4418.26	Nov. 24	
5	600 pounds Cotton Meal 200 pounds Acid Phosphate	30.20	8.	14.56	11.50	1.13	78.98	9.82	137.27	4145.55	Nov. 26	
6	300 pounds Cotton Meal 300 pounds Acid Phosphate 300 pounds Kainite	28.78	8.1	14.66	11.40	1.04	77.76	9.12	137.76	3964.73	"	
7	600 pounds Cotton Meal	27.34	8.3	15.06	12.50	1.13	83.00	9.04	151.27	4135.72	"	
8	260 pounds Sulphate Ammonia 460 pounds Acid Phosphate 80 pounds Muriate Potash	32.06	8.3	15.06	12.30	.93	81.67	7.31	152.67	4894.60	"	
9	300 pounds Acid Phosphate 300 pounds Kainite	21.26	8.9	16.06	14.10	.64	87.79	4.53	183.96	3910.92	"	
10	300 pounds Kainite	20.82	9.1	16.56	14.40	.46	86.95	3.19	191.94	3996.19	"	
11	200 pounds Cotton Meal 100 pounds Floats	18.70	9.	16.36	13.50	.81	82.51	6.00	171.99	3216.21	"	
12	333 pounds Cotton Meal 167 pounds Floats	21.96	8.0	15.86	13.50	.81	85.11	6.00	171.99	3776.90	"	
13	No Manure	17.40	8.8	15.86	13.50	8.4	85.11	6.22	171.30	2980.62		
14	466 pounds Cotton Meal 234 pounds Floats	24.83	8.5	15.46	12.80	.94	82.79	7.42	159.46	3959.18		
15	600 pounds Cotton Meal 300 pounds Floats	27.32	8.5	15.36	13.00	.98	84.63	7.53	161.42	4409.99		
16	600 pounds Cotton Meal 300 pounds Floats 300 pounds Kainite	29.56	8.4	15.16	12.3	1.00	81.13	8.3	151.20	4469.47		
17	600 pounds Cotton Meal 300 pounds Floats 300 pounds Kainite 200 pounds Gypsum	27.40	8.4	15.26	13.7	.84	89.77	6.3	160.16	4388.38		
18	No Manure	19.14	8.7	15.76	13.6	.86	86.23	6.32	172.34	3298.58		
19	600 pounds Cotton Meal 300 pounds Floats 300 pounds Cotton Hull Ashes	26.18	8.8	15.86	13.7	.94	86.38	6.86	172.06	4504.53		
20	300 pounds Tankage	19.06	8.9	16.06	13.7	.74	84.05	5.40	176.26	3359.51		
21	450 pounds Tankage	22.60	9.2	16.66	14.5	.74	87.03	5.10	187.46	4236.59		
22	700 pounds Tankage	25.68	8.6	15.66	13.8	.86	88.12	6.23	175.14	4497.59		
23	No Manure	18.72	8.8	15.86	14.0	.77	88.27	5.60	179.83	3366.41		
24	900 pounds Tankage	26.52	8.5	15.46	13.0	.84	84.08	6.46	164.36	4358.82		
25	900 pounds Tankage 300 pounds Kainite	27.96	8.7	15.76	13.9	.80	88.19	5.75	177.80	4960.28		
26	900 pounds Tankage 300 pounds Kainite 200 pounds Gypsum	32.12	8.3	15.06	12.0	.86	79.68	7.16	149.94	4816.07		
27	900 pounds Tankage 300 pounds Cotton Hull Ashes	25.62	8.4	15.26	12.6	.92	82.56	7.30	157.08	4024.38		
28	No Manure	20.42	8.6	15.66	14.5	.04	92.65	6.48	183.26	3742.16		
29	1700 pounds Cotton Seed (Raw)	25.38	8.5	15.46	13.6	.98	87.96	7.20	169.82	4310.03	Dec. 3	
30	1700 pounds Cotton Seed (Raw) 300 pounds Acid Phosphate	27.02	8.8	15.86	14.0	.94	88.27	6.71	176.26	4762.54	Dec. 4	
31	1700 pounds Cotton Seed (Raw) 300 pounds Acid Phosphate 300 pounds Kainite	29.02	8.9	16.01	14.4	.76	89.94	5.28	185.64	5387.27	Dec. 5	
32	1700 pounds Cotton Seed (Raw) 300 pounds Cotton Hull Ashes	26.72	8.6	15 69	14.3	1.00	91.14	7.00	179.20	4788.22		
33	No Manure	21.96	8.6	15.56	14.0	.94	89.97	6.71	176.26	3870.66		
34	1700 pounds Cotton Seed (Raw) 300 pounds Floats	23.92	8.4	15.16	12.0	1.00	79.15	8.33	147.00	3516.24		
35	1700 pounds Cotton Seed (Raw) 300 pounds Floats 200 pounds Gypsum	28.20	8.4	15.16	13.2	.93	87.07	7.04	165.27	4660.91		

PLAT II.—Stubble Cane.

Harvested November 8th—December 2d, 1887.

No. of Experiment	1	2	3	4	5
Yield per acre, tons	23.28	28.22	33.38	30.20	30.20
Total Solids	16.10	14.97	14.83	14.66	14.56
Sucrose	14.90	12.30	12.10	12.40	11.53
Glucose	.80	1.21	1.18	1.30	1.13
Lbs. available sugar per acre	4465	4143	4500	4418	4146
No. of Experiment	**10**	**9**	**8**	**7**	**6**
Yield per acre, tons	20.82	21.26	32.06	27.34	28.78
Total Solids	16.56	16.06	15.06	15.06	14.66
Sucrose	14.40	14.10	12.30	12.50	11.90
Glucose	.46	.64	.93	1.13	1.04
Lbs. available sugar per acre	3996	3911	4895	4136	3965
No. of Experiment	**11**	**12**	**13**	**14**	**15**
Yield per acre, tons	18.70	21.96	17.40	24.83	27.32
Total Solids	16.36	15.86	15.86	15.46	15.36
Sucrose	13.50	13.50	13.50	12.83	13.00
Glucose	.81	.81	.84	.94	.98
Lbs. available sugar per acre	3216	3777	2981	3959	4410
No. of Experiment	**20**	**19**	**18**	**17**	**16**
Yield per acre, tons	19.06	26.18	19.14	27.40	29.56
Total Solids	16.06	15.86	15.76	15.26	15.76
Sucrose	13.70	13.70	13.60	13.70	12.30
Glucose	.74	.94	.86	.84	1.00
Lbs. available sugar per acre	3360	4505	3299	4388	4469
No. of Experiment	**21**	**22**	**23**	**24**	**25**
Yield per acre, tons	22.60	25.68	18.72	26 52	27.96
Total Solids	16.46	15.66	15.56	15.46	15.76
Sucrose	14.50	18.80	14.00	13.00	13.90
Glucose	.74	.86	.77	.84	80
Lbs. available sugar per acre	4237	4498	3366	4359	4960
No. of Experiment	**30**	**29**	**28**	**27**	**26**
Yield per acre, tons	27.02	25.38	20.42	25.62	32.12
Total Solids	15.86	15.46	15.66	15.26	15.06
Sucrose	14.00	13.60	14.50	12.60	12.00
Glucose	.94	.98	.94	.92	.86
Lbs. available sugar per acre	4763	4310	3742	4024	4816
No of Experiment	**31**	**32**	**33**	**34**	**35**
Yield per acre, tons	29.02	26.72	21.96	23.92	28.20
Total Solids	16.01	15.69	15.56	15.16	15.16
Sucrose	14.40	14.30	14.00	12.00	13.20
Glucose	.76	1.00	1.00	1.05	.93
Lbs. available sugar per acre	5387	4788	3870	3516	4661

No Manure

The inspection of above table will show that many of the popular manures are exceedingly valuable; that the different forms of nitrogen in cotton seed, cotton seed meal, tankage and sulphate ammonia, and dried blood, are about equally efficacious as sources of nitrogen, and that large tonnage is not always productive of largest sugar yields, and therefore manuring should be done judiciously both as to quantity and quality.

PLATS IV. AND V.—SPRING PLANT CANE.

Planted March 3d upon freshly prepared land which had been for years in succession cane. The drouth prevented early germination and hence it was May before the sufficient stand was obtained to permit of cultivation.

The following are the manures used per acre on each plat, No. IV. untiled and No. V. tiled; otherwise the treatment was identical:

Experiment No. 1—500 pounds Cotton Seed Meal. 500 pounds Acid Phosphate. 500 pounds Kainite.
Experiment No. 2—500 pounds Cotton Seed Meal. 500 pounds Acid Phosphate.
Experiment No. 3—Nothing.
Experiment No. 4—500 pounds Cotton Seed Meal. 500 pounds Orchilla Phosphate. 500 pounds Kainite.
Experiment No. 5—500 pounds Cotton Seed Meal. 500 pounds Orchilla Phosphate.
6—Nothing.
Experiment No. 7—500 pounds Cotton Seed Meal. 500 pounds Bone Dust. 500 pounds Kainite.
Experiment No. 8—500 pounds Cotton Seed Meal. 500 pounds Bone Dust.
9—Nothing.
Experiment No. 10—500 pounds Cotton Seed Meal. 500 pounds Floats. 500 pounds Kainite.
Experiment No. 11—500 pounds Cotton Seed Meal. 500 pounds Floats.
12—Nothing.
Experiment No. 13—500 pounds Cotton Seed Meal. 500 pounds Ashes Cotton Hulls. 500 pounds Kainite.
Experiment No. 14—500 pounds Cotton Seed Meal. 500 pounds Ashes Cotton Hulls.
15—Nothing.
16—500 pounds Cotton Seed Meal.
17—500 pounds Acid Phosphate.
18—500 pounds Kainite.
19—Nothing.

The treatment of this plat was the same as others already given, except it was not laid by till July.

TABLE 11.

PLATS NOS. 4 AND 5—UNTILED AND TILED.

No. of Experiment.	Manures Used Per Acre.	Yield per acre in tons.	ANALYSES.				Purity Coefficient.	Glucose Ratio.	Lbs. available sugar upon 70 per cent extraction.		When Harvested.	Remarks.
			Degrees Baume.	Total Solids.	Sucrose.	Glucose.			Per ton.	Per acre.		
1	Untiled	18.92	8.4	15.26	12.20	1.06	80.26	8.60	148.44	2811.48	Nov. 30	
	Tiled	27.10	8.3	14.96	12.50	1.05	83.55	8.40	152.95	4144.94	"	
2	Untiled	25.00	8.2	14.86	12.50	1.05	84.12	8.40	152.95	3823.75		
	Tiled	26.64	8.5	15.46	11.40	1.30	73.73	11.40	132.30	3524.47		
3	Nothing	14.95	8.4	15 16	13.00	1.05	85.75	8.08	173.95	2600.55		
4	Untiled	23.26	8.6	15.56	12.40	1.00	79.68	8.03	152.60	3546.47		
	Tiled	26.14	8.2	14.86	12.00	1.05	80.75	8.75	145.95	3815.13		
5	Untiled	23.70	8.6	15.56	12.40	1.04	79.68	8.38	151.76	3596.71		
	Tiled	24.80	8.3	15.06	12.40	1.05	83.00	8.40	152.95	3793.16		
6	Nothing	14.26	7.9	14.26	12 50	1.09	87.65	8.72	152.18	2160.95		
7	Untiled	20.16	8.6	15.56	13.60	.80	83.55	6.15	165.20	3330.43		
	Tiled	24.64	....	.....	.....	....	.....	.....	.....	.....	.....	Sample lost.
8	Untiled	23.68	8.3	15.06	12.00	1 40	79.67	11.66	138.60	3198.88	Nov. 30	
	Tiled	24.60	8.3	14.96	12.70	1.05	84.89	8.26	155.75	3831.45	"	
9	Nothing	17.18	8.3	14.96	12.70	1.05	84.89	8.26	155.75	2675.78		
10	Untiled	15.94	8.7	15.76	12.30	1.00	78.04	8.13	151.20	2410.12		
	Tiled	26.36	8.3	15.06	13.00	1.00	86.32	7.69	161.00	4234.30		
11	Untiled	19.96	8.4	15 26	12.00	1.35	78.94	11.25	139.65	2787.40		
	Tiled	22.91	8.3	14.96	12.50	1.05	83.55	8.40	152.95	3504.08		
12	Nothing	14.86	8.6	15.66	13.90	.92	88.76	6.62	175.28	2604.66		
13	Untiled	15.10	8.5	15.37	13.40	1.30	87.83	9.70	160.30	2420.53		
	Tiled	23.54	8.9	16.17	14.70	.60	90.90	4.08	193.20	4549.92		
14	Untiled	17.84	9.	16.27	15.00	.90	92.19	6.00	191.10	3409.22		
	Tiled	20.06	8.4	15.26	12.80	.96	83.88	7.50	159.04	3190.34		
15	Nothing	13.78	8.6	15.57	12.90	1.04	82.20	8.06	158.76	2176.71		
16	Untiled	16.10	8.4	15.27	14.10	.65	92.33	4.61	183.75	2978.37		
	Tiled	20.10	8.2	14.87	13.60	.78	87.42	6.00	165.62	3328.96		
17	Untiled	12.00	7.8	14.17	11.10	1.04	78.33	9.37	133.56	1602.72		
	Tiled	15.92	8.3	14.97	13.00	.86	86.84	6.61	163.94	2609.92		
18	Untiled	13.98	8.5	15.34	13.35	.77	87.02	5.77	170.73	2386.80		
19	Tiled	19.17	7.7	13.97	12.60	.93	85.89	7.75	148.40	2844.82		
	Nothing	14.82	8.3	14.97	13.70	1.00	91.51	7.29	170.80	2531.25		

PLAT IV.—UNTILED AND V TILED.

	UNTILED.		TILED.			
	Kainite		No Manure	Kainite		
No. of Experiment.....	1	2	3	1	2	
Yield per acre in tons....	18.92	25.00	14.95	27.10	26.64	Cotton Meal.
Total Solids	15.26	14 86	15.16	14.96	15.46	Acid Phosphate.
Sucrose	12.20	12.50	13.00	12.50	11.40	
Glucose.....	1.06	1.05	1.05	1.05	1.30	
Lbs. av. sugar per acre..	2811	3824	2600	4145	3524	
No. of Experiment.....	4	5	6	4	5	
Yield per acre in tons....	23.26	23.70	15.30	26.14	24.80	Cotton Meal.
Total Solids	15.56	15.56	14.26	14.86	15.06	Orchilla.
Sucrose	12.40	12.40	12.50	12.00	12.50	
Glucose.....	1.04	1 04	1.09	1.05	1.05	
Lbs. av. sugar per acre..	3549	3596	2161	3815	3793	
No. of Experiment.....	7	8	9	7	8	
Yield per acre in tons....	20.16	23.68	17.18	24.64	24.60	Cotton Meal.
Total Solids	15.56	15.06	14.96	....	14.96	Bone Meal.
Sucrose.....	13.60	12.00	12.70	.....	12.70	
Glucose.....	.80	1.40	1.05	.....	1.05	
Lbs. av. sugar per acre..	3330	3198	2676	.....	3831	
No of Experiment.....	10	11	12	10	11	
Yield per acre in tons....	15.94	19.96	14.86	26.36	22.91	Cotten Meal.
Total Solids	15.76	15.26	15.66	15.06	14.96	Floats.
Sucrose.....	12.30	12.00	13.90	13.00	12.50	
Glucose.....	1.00	1.35	.92	1.00	1.05	
Lbs. av. sugar per acre..	2410	2787	2604	4234	3564	
No. of Experiment.....	13	14	15	13	14	
Yield per acre in tons....	15.10	17.84	13.78	23.54	20.06	Cotton Meal.
Total Solids	15.37	16.27	15.57	16 17	15.26	Cotton Hull Ashes.
Sucrose.....	13.40	15.00	12.90	14.70	12.80	
Glucose.....	1.30	.90	1.04	.60	.96	
Lbs. av. sugar per acre..	2420	3409	2177	4549	3190	
No. of Experiment.....	16	17	18	16	17	
Yield per acre in tons....	16.10	12.00	14.82	20.10	15.92	
Total Solids	15.27	14.17	14.97	14.87	14.97	
Sucrose.....	14.10	11.10	13.70	13.60	13.00	
Glucose.....	.65	1.04	1.00	.78	.86	
Lbs. av. sugar per acre..	2978	1603	2531	3329	2610	
No of Experiment.....	19	19	18	19	19	
Yield per acre in tons....	13.98	13.98	14.82	19.17	19.17	
Total Solids	15.34	15.34	14.97	13.97	13.97	
Sucrose.....	13.35	13.35	13.70	12.60	12.60	
Glucose.....	.77	.77	1.00	.93	.93	
Lbs. av. sugar per acre..	2386	2386	2531	2845	2845	

No Manure

Nos. 16 is Cotton Seed Meal alone.
Nos. 17 is Acid Phosphate alone.
Nos. 19 is Kainite alone.

DEDUCTIONS FROM ABOVE.

Sett 1.	Tons.	Pounds available sugar.
Increase Experiment 1 tiled over untiled	8.18	1334
" " 4 " " "	2.88	266
" " 7 " " "	4.48	....
" " 10 " " "	10.42	1824
" " 13 " " "	8.44	2129
" " 16 " " "	4.00	351
" " 19 " " "	5.19	459
Total	43.59	6353

Sett 2.	Tons.	Pounds available sugar.
Increase Experiment 2 tiled over untiled	1.64	
" " 5 " " "	1.10	197
" " 8 " " "	.92	633
" " 11 " " "	2.95	717
" " 14 " " "	2.22	
" " 17 " " "	3.92	1007
" " 19 " " "	5.19	459
Total	18.04	3013
Less		519
		2494
Increase of 14 Expertments, tiled over untiled	61.63	8858
Average increase per acre	4.40	633
Average increase first sett	6.23	909
Average increase second sett	2.58	357

Here the average increase of all the tiled over the untiled plats is at the rate of 4.4 tons of cane with 633 pounds available sugar per acre. Taking the first sett of untiled that furthest from the tiled and we have the increase 6.23 tons and 909 pounds available sugar which more nearly represents the true difference between tiled and untiled land, since the second sett runs within a few feet of the tiled land and the beneficial effects of the tiles are perfectly apparent both in the working of the land and the increase of crops. On this piece the difference between it and its fellow tiled, is only 2.58 tons and 357 pounds available sugar.

EFFECTS OF TILE DRAINING

are apparent not only in the increased yield, but in the improved tilth of the soil. In fact, not only is the soil directly over the tiles improved, but the good effects are gradually extending laterally and even plainly visible this year in the outside rows of the adjoining plats. Plats IV. and VII. adjoin plats V. and VI. which are tile drained. The experiments on the extreme left upon the former (second sett in above) and those upon the extreme right in the latter (basal mixture in the phosphoric acid

manures) were this year plainly influenced by the proximity of the tiles. So decided is their influence, that experiments of a manurial character cannot in the future be made upon them. It may be asserted with almost a certainty, that tiles properly laid will increase the crop fully 33⅓ per cent in these black lands.

SUMMARY OF RESULTS.

1st. That the upper portion of the cane is the equal if not the superior to the lower part for seed, while the latter is much richer in sugar, suggesting the propriety of utilizing the upper thirds of the cane for seed and the lower ⅔ of the entire crop for the manufacture of sugar.

2d. That two stalks of good sound cane properly planted in a well prepared seed bed is an abundance for maximum results. More than this, if germination be good, may prevent that healthy suckering so essential to a full development of a cane plant.

3d. That seed from good first year stubble has given as good results the first year, as seed from plant.

4th. That a large application (3 tons per acre) of caustic lime seems to have increased the sugar in the cane.

5th. That stubbles (ratoons) come equally as well from the original sprouts as from suckers.

6th. That several foreign varieties of cane promise adaptability to our wants.

7th. That nitrogen in some form is needed by our soils to grow cane.

8th. That while nitrogen in the form of sulphate of ammonia has given slightly better results, no form of nitrogen appears to have a marked advantage over any other, thus enabling us to utilize our own cotton seed meal with the full assurance that it is the equal of dried blood, fish scrap, etc.

9th. That excessive quantities of nitrogen are injurious to the sugar content, and that 24 to 48 pounds per acre are amounts suggested by experiments for best results.

10th. That nitrogen to produce the maximum results should be used in moderate quantities and properly combined with mineral manures.

11th. That mineral manures alone are without apparent effect, but combined properly with nitrogen are productive of the highest results.

12th. That phosphoric acid is needed by cane on this soil and is best supplied in soluble forms. The insoluble forms in floats and Orchilla guano, seems also after two years' application to be highly available.

13th. That excessive quantities of phosphoric acid are not beneficial.

14th. That potash in small quantities is without visible results, the year it is applied, but used in excessive quantities for two years upon the same soil has given an increased tonnage of cane without altering its sugar content.

15th. That cane gives no preference for any form of potash.

16th. That excessive quantities of nitrogenous manures produce large tonnage with very low sugar content. (See Plat XV.)

17th. That an average crop of pea vines turned under, furnish to each acre about 56 pounds nitrogen, 16 pounds phosphoric acid and 92 pounds potash, quantities contained in 800 pounds cotton seed meal and 640 pounds kainite.

18th. That the roots of peas after the vines are removed, furnish plant food equivalent to about what is contained in 120 pounds cotton seed meal and 130 pounds kainite, and that their good effects when turned over without vines must be traceable rather to mechanical than chemical properties.

19th. That draining the land by tiles has increased both the tonnage and available sugar; this year the increase is calculated at about 33⅓ per cent.

20th. That the effects of tiles are plainly discernible in the plats adjoining those tiled, for distances equalling 20 feet.

Applying the above deductions, the Station would suggest that manuring should be intelligently done with reference to both the soil and the cane. If the cane is grown for the mill a fully matured stalk is desired, which cannot be obtained by excessive manuring. If grown for seed, high fertilization is permissible but not advisable.

If the soil be in good tilth, and rich in vegetable matter, less nitrogen and more mineral manures are suggested. Such is usually the case with new ground and where a heavy coat of pea vines has been turned under. If the soil be fair both in tilth and organic matter, then the nitrogen and mixed minerals should be used in such a proportion as to afford a slight excess of phosphoric acid over nitrogen. If the soil has been worn by continuous cropping in cane, then nitrogen should equal phosphoric acid, such obtains usually with stubble and succession cane.

It is therefore safe to recommend for new ground, pea vines fallow, etc., a manure containing one part of nitrogen to four parts of phosphoric acid, a mixture of one part of cotton seed meal to two of acid phosphate fills this requirement.

For fair soils the nitrogen should be to phosphoric acid as 1 and 2. Such is found in an equal mixture of cotton seed meal and acid phosphate.

For stubble and succession lands the nitrogen may equal or even exceed the phosphoric acid. Two parts of cotton seed meal to one part of acid phosphate supply these ingredients in about equal quantities. Three parts of the former to one of the latter may sometimes be used with excellent results.

Instead of cotton seed meal the other forms of nitrogen may be used with equal prospects of success.

The above mixtures usually produce the best results when used in quantities not exceeding 800 to 900 pounds per acre. It is believed that a good crop of cane with good seasons, well and early cultivated, can appropriate about these quantities of manures by the 1st or middle of September, at time which it is desirable that its growth should be arrested in order that maturation may begin.

SUGAR HOUSE AND LABORATORY EXPERIMENTS.

Pending the issuance of a Bulletin containing the record of work in the sugar house, the following announcements of results may not be inappropriate in this Bulletin. Mention has been made in this Bulletin of the superior content of sugar in the lower portion over the upper part of the stalk of cane. Numer-

ous experiments have been made to test this. The following are selected to illustrate this truth.

Experiment No. 1—A stalk 8.17 feet long was divided into 4 parts of equal lengths. Each part was weighed, passed through a mill, and bagasse weighed. The juice was also caught and carefully analyzed. The following are the results:

No. of Part.	Per cent of Stalk.	Weight before crushing in grams.	Weight of Bagasse in grams.	Weight of juice in grams.	Percentage extraction.	ANALYSES.			Grams available sugar
						Total Solids.	Sucrose.	Glucose.	
Top, upper fourth	20.	587.7	235.9	351.8	59.86	11.3	8.5	1.12	23.29
Next to upper fourth	24.	694.2	234.05	460.1	66.29	15.4	12.5	.80	51.99
Next to lower fourth	27.5	803.0	256.50	546.5	68.08	16.3	13.5	.78	67.38
Butt or lower fourth	28.5	820.5	268.90	551.6	67.23	16.7	14.8	.64	76.34

Here the upper fourth which is about 20 per cent by weight of the stalk, gave 23.99 grams of available sugar out of a total of 220 grams, or about 11 per cent. Again the percentage of extraction was also considerably below the others.

Experiment No. 2—Another stalk 7 feet 4 inches long was also cut into four parts of about equal lengths, the juice carefully weighed and analyzed. The following are the results:

No. of Part.	Weight of juice in grams.	Per cent extraction.	ANALYSIS.			Grams available sugar.	available sugar per ton.	
			Total Solids.	Sucrose.	Glucose.		Per cent.	Pounds.
Top, upper fourth	343.2	67.57	14.6	11.2	1.03	32.7	6.4	128
Next to lower fourth	415.6	71.37	16.6	14.5	1.00	54.	9.27	185
Next to lower fourth	360.3	71.70	16.6	15.0	.86	49.4	9.80	196
Next to lower fourth	411.2	74.16	17.1	15.3	.75	58.3	10.00	200

The average of all per ton is ..... 177 lbs. available sugar.
Without the top or upper fourth ..... 194 " " "
Without the upper half ..... 198 " " "
Without the upper three-fourths ..... 200 " " "

Here the upper fourth representing about 23 per cent in weight of entire stalk, gave only about 11 per cent of the available sugar. Nothing more clearly shows that the upper fourth is decidedly inferior to the rest of the stalk in sugar content.

ANALYSIS OF A STALK OF CANE.

A stalk of cane was split its entire length. The first half was run through the mill and the juice and bagasse analyzed separately. The second half was analyzed as a whole. The following are the results:

Mill extraction gave for the first half—

Juice	76.32 per cent.
Bagasse	23.68 per cent.

ANALYSIS.

	Total Solids.	Sucrose.
Juice	15.9	13.4
Bagasse	44.96	9.28

Therefore we have in 100 parts of the cane:

Water in juice	64.17	Sucrose in juice	10.21
Water in bagasse	13.10	Sucrose in bagasse	2.21
Total in cane	77.27	Total in cane	12.42

The second half gave by direct analysis:

Water	77.13 per cent.
Ash	.62 per cent.
Sucrose	12.47 per cent.
Glucose	.70 per cent.
Fibre	8.39 per cent.
Total solids	22.87 per cent.

Therefore we have for 100 parts of cane:

	Water.	Sucrose.	Glucose.	Fibre.	Ash.	Other Solids.
First half	77.27 per cent.	12.42 per cent.				
Second half	77.13	12.47	.70	8.39	.62	.69
Average	77.16	12.45	.70	8.39	.62	.69

And this may be taken as a fair analysis of Louisiana plant cane.

METHODS OF CLARIFICATION.

The following were used: 1st, lime alone; 2d, sulphur and lime; 3d, bisulphite and lime, and 4th, tannic extract and lime.

These were used under varying conditions. An open pan was used to concentrate in this year and a loss always occurred by inversion during concentration. When lime was used alone or with tannic extract the inversion was the least; in fact, very little. With sulphur and bisulphite, there was always inversion

increasing just in proportion to the acidity of the clarified juice. It is of the utmost importance when these reagents are used, that the juice be made as nearly neutral as possible with lime before concentrating.

The bisulphite above was kindly donated by Mr. H. Bonnabel, of New Orleans. The tannic extract was donated by Mr. Frank Ames, of Boston, the owner of the fine sugar plantation (Milladon) opposite New Orleans. This extract costs in Boston five cents a pound and this quantity clarifies 200 gallons of juice. Samples of the sugars and molasses made by this process have been carefully preserved for future examination. The scums and settlings from tannic extract were easily filtered and the cakes made are to-day perfectly sound, showing no sign of fermentation, while those made otherwise have long since whitened with decomposing matters. The filter press made by Pusey & Jones, and kindly lent the Station was again used this year to demonstrate the loss occasioned by the wasteful process of throwing the scums and settlings in the ditch.

EXPERIMENTS WITH DECOLORIZING AGENTS.

Kleeman's process of filtering juices and scums was frequently tried during the season, using two varieties of German lignite, Alabama lignite and charcoal.

Both the scums and whole juices were each separately tried with the above lignites, treating them successively, acid, neutral and alkaline. The percentage of each lignite to the juice used most desirable for good work, was also determined. Both the German and Alabama lignite filtered well and strongly decolorized, preference being given by all present to the latter. Charcoal was very inferior. The best work was accomplished with 5 pounds lignite to 30 gallons of juice. Alabama lignite was successfully used also in brightening black molasses.

Ten tons of this Alabama lignite has been donated for filtering purposes on a large scale to parties in New Orleans, and hopes are entertained of its successful introduction into the sugar industry of Louisiana.

Full details of above experiments will be given in our Bulletin on the sugar house.

CONCLUSIONS.

In the last quarter of a century wonderful progress has been made in machinery for making sugar, so that the yield per ton of cane has been gradually increasing until to-day the startling announcement is made that by diffusion upon Magnolia plantation 231 pounds of sugar per ton of cane has been obtained. Such progress in a few years is almost incredible. The open kettle has been supplanted by the vacuum strike pan; the centrifugal purges in a few moments and in a much more satisfactory manner, the masse cuite that once drained for weeks in the purgery. The evaporation "in vacuo" by the simple, cheap, and economical double, triple or quadruple effect, is as far superior to the open pans, as this is to the iron kettle. The three-roller mill banished the two vertical rolls, to be in turn overshadowed by the five-roller. Even these, with a shredder attachment, is now subordinated in its efficiency to the diffusion cells, a recognition of the superiority of chemical effect over mechanical power.

Such has been the marvelous march of mechanical improvement in the manufacture of sugar. Has the agriculture of sugar kept pace with its mechanics? By no means! The reasons for this, numerous and incontrovertible, need not be given here. Suffice to say, that in the next quarter of the century a large portion of our time must be devoted to an education of the cane plant. It must be sent to school and be made to imbibe in large quantities those ingredients which shall cause its cells to distend with saccharine life. The action of manures, the functions of the soil, the differentiation of varieties, and the vicissitude of the seasons, must engage the intelligence of our planters. In the field and in the laboratory must be the work of those who wish to advance the science and art of successful sugar growing in the next generation. It is therefore with pardonable pride that this Station presents this Bulletin to the public, the record of the first systematic work in the agriculture of sugar cane done in Louisiana, and invites a careful perusal of its contents, and such an earnest moral and pecuniary support as to enable it to amplify its work and extend its investigations.

RECORD OF WEATHER LOUISIANA SUGAR EXPERIMENT STATION FOR JULY, 1887.

Date.	Temperature.					Rainfall.
July.	9 a. m.	3 p. m.	9 p. m.	Maximum.	Minimum.	Inches.
1	82°	75°	75°	82°	70°	3.29
2	80	80	..	80	71	.80
3	81	80	79	92	68	
4	85	82	78	92	72	
5	87	88	80	94	73	
6	84	81	78	92	74	.33
7	85	86	77	92	73	.61
8	83	88	79	92	74	
9	85	91	81	92	74	
10	87	80	..	93	76	
11	86	89	76	94	74	
12	87	81	80	94	71	.09
13	87	82	77	89	72	.09
14	86	83	76	93	71	.33
15	85	85	80	93	71	
16	85	90	86	91	73	
17	85	86	80	95	76	.10
18	86	87	78	95	73	
19	88	92	82	93	76	
20	89	92	79	95	77	.10
21	85	78	78	93	77	.92
22	85	89	82	93	75	
23	83	84	79	93	75	.13
24	88	78	76	93	74	.46
25	84	87	78	93	72	
26	83	75	76	88	72	.31
27	92	90	83	91	72	
28	87	89	84	96	76	
29	90	92	85	95	77	
30	89	85	80	97	74	.30
31	89	92	84	94	76	
Aver.	85.4	86.7	79.4			7.86

Maximum Temperature, 97°.
Minimum " 68°.

Daily Rainfall, .253.

RECORD OF WEATHER LOUISIANA SUGAR EXPERIMENT STATION FOR AUGUST, 1887.

Date.	Temperature.					Rainfall.
August.	9 a. m.	3 p. m.	9 p. m.	Maximum.	Minimum.	Inches.
1	33°	78°	80°	91°	79°	.65
2	86	77	82	92	72	
3	89	83	80	95	76	.17
4	88	83	83	93	73	
5	81	76	76	89	77	1.67
6	84	79	76	91	73	.58
7	86	89	81	93	74	
8	86	89	81	95	74	
9	83	79	82	91	74	.40
10	88	75	73	86	73	.44
11	83	84	78	89	70	.49
12	84	88	81	89	72	
13	84	87	77	91	72	
14	84	86	80	89	70	
15	84	89	79	90	70	
16	84	84	80	90	72	
17	84	81	79	91	74	.25
18	84	86	80	89	75	
19	81	89	80	90	75	
20	84	88	..	..	75	
21	85	84	80	92	75	
22	85	90	82	92	71	
23	87	93	81	94	76	
24	84	89	81	90	75	
25	85	93	78	93	74	1.43
26	84	88	77	90	74	.5
27	77	83	75	83	74	
28	81	83	74	83	70	
29	80	85	74	86	69	
30	80	84	76	85	70	....
31	78	82	74	82	72	.12
Aver.	84	85	78.4			6.70

Maximum Temperature, 95°.
Minimum " .69°.

Daily Rainfall, .216.

RECORD OF WEATHER LOUISIANA SUGAR EXPERIMENT STATION FOR SEPTEMBER, 1887.

Date.	Temperature.					Rainfall.
September.	9 a. m.	3 p. m.	9 p. m.	Maximum.	Minimum.	Inches.
1	80°	82°	73°	83°	70°	
2	81	83	71	85	68	
3	80	86	74	86	67	
4	80	87	74	87	67	
5	81	86	75	86	67	
6	81	83	71	86	66	
7	83	89	76	89	66	
8	83	91	77	91	74	
9	81	92	80	92	69	
10	82	92	82	92	74	
11	85	92	83	92	74	
12	85	84	78	88	75	.47
13	78	86	76	89	70	
14	81	87	75	87	70	
15	82	90	78	90	71	
16	83	91	77	91	73	
17	80	89	77	89	72	
18	76	79	77	79	72	.62
19	76	75	73	79	71	1.62
20	73	79	75	79	71	.29
21	75	81	77	81	71	
22	82	86	80	86	74	
23	80	86	75	86	69	
24	72	77	67	77	66	
25	70	80	68	80	60	
26	70	77	74	80	64	
27	70	79	69	80	67	
28	70	75	64	75	62	
29	69	75	63	76	57	
30	70	79	63	79	56	
Aver.	78.4	84	74			3.30

Maximum Temperature, 92°.
Minimum " 56°.

Daily Rainfall, .11.

RECORD OF WEATHER LOUISIANA SUGAR EXPERIMENT STATION FOR OCTOBER, 1887.

DATE.	TEMPERATURE.					RAINFALL.
October.	9 a. m.	3 p. m.	9 p. m.	Maximum.	Minimum.	Inches.
1	74°	80°	73°	80°	57°	
2	70	80	74	83	60	
3	77	84	74	84	69	
4	80	83	73	84	70	
5	75	82	74	82	65	
6	80	85	74	85	65	
7	78	81	73	82	65	
8	81	85	73	78	65	
9	81	86	73	86	66	
10	82	83	73	85	66	
11	74	70	66	76	70	
12	57	66	59	66	54	
13	62	71	65	73	54	
14	68	76	65	76	58	
15	71	77	71	77	57	
16	70	76	65	76	61	
17	72	..	71	81	..	
18	72	..	71	81	..	3.2
19	72	..	68	82	61	3.
20	70	76	67	76	61	.06
21	63	69	60	69	61	
22	62	..	59	70	55	
23	71	79	68	79	56	
24	..	84	74	84	63	
25	77	63	59	74	65	.07
26	58	60	58	60	54	.06
27	60	63	62	63	56	
28	63	66	60	66	58	
29	62	72	..	72	54	
30	52	55	47	55	49	
31	..	..	52	60	40	
Aver.	67.8	75	65.7			6.39

Maximum Temperature, 86°.
Minimum " 40°.

Daily Rainfall, .206.

RECORD OF WEATHER LOUISIANA SUGAR EXPERIMENT STATION FOR NOVEMBER, 1887.

DATE.			RAINFALL
November.	Maximum	Minimum.	Inches.
November 1	74	42	
" 2	70	42	
" 3	70	44	
" 4	72	46	
" 5	71	45	
" 6	..	53	
" 7	75	53	
" 8	69	64	
" 9	69	64	
" 10	71	64	
" 11	73	49	
" 12	73	39	
" 13	73	..	
" 14	..	50	
" 15	78	52	
" 16	77	50	
" 17	77	50	
" 18	61	59	
" 19	64	52	
" 20	70	..	
" 21	..	30	
" 22	71	..	
" 23	76	55	
" 24	77	56	
" 25	76	59	
" 26	78	60	
" 27	80	60	.11
" 28	59	44	
" 29	60	37	
" 30	62	44	
			.11

Maximum 80°.
Minimum 30°.
Daily Rainfall .003.

RECORD OF WEATHER LOUISIANA SUGAR EXPERIMENT STATION
FOR DECEMBER, 1887.

DATE.	TEMPERATURE.					RAINFALL.
December.	9 a. m.	3 p. m.	9 p. m.	Maximum.	Minimum.	Inches.
1	57°	61°	52°	61°	44°	
2	63	70	66	70	55	
3	71	76	66	76	63	
4	72	77	62	77	60	.91
5	59	65	57	65	57	
6	57	69	62	69	50	
7	70	71	66	76	60	.66
8	63	64	55	64	60	
9	60	60	52	60	52	
10	54	60	50	61	43	
11	57	64	56	64	43	
12	54	55	51	55	51	
13	54	60	..	60	45	1.42
14	55	56	56	56	52	
15	56	59	55	59	53	.16
16	50	58	50	58	42	.24
17	44	47	42	47	36	
18	51	58	40	60	45	
19	55	61	53	61	49	.94
20	53	58	47	..	36	
21	38	41	40	41	33	
22	36	40	40	41	55	.95
23	43	44	42	44	39	1.86
24	40	43	40	43	33	
25	43	46	..	48	39	
26	48	61	..	63	40	
27	47	65	63	67	45	
28	48	51	40	51	30	
29	35	43	40	43	34	
30	42	52	59	71	39	
31	71	72	66	73	49	
Aver.	53.2	58.3	52.4			7.14

Maximum Temperature, 77°.
Minimum " 30°.

Daily Rainfall, .23.

CONDENSED WEATHER RECORD OF SUGAR EXPERIMENT STATION FOR THE YEAR 1887.

Month.	Average Temperature	Maximum Temperature	Minimum Temperature	Rainfall in Inches.
January	57°	82°	22°	3.31
February	65.4	80	30	5.23
March	58.2	81	40	3.27
April	71.7	89	57	2.21
May	78.	94	59	6.56
June	84.	94	62	10.35
July	84.	97	68	7.86
August	82.5	95	69	6.70
September	79.	92	56	3.30
October	69.5	86	40	6.39
November	60.	80	30	.11
December	54.6	77	30	7.14

Average Temperature for the year.....70.3°
Maximum " " " .....97°
Minimum " " " .....22°
Total Rainfall " " " .....62.43 inches.